THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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Their Coal is in use in the Salford, Stafford, Bolton, and other large Gas-Works in England, Ireland, Wales, and Abroad, giving in practical working 10,300 feet of 17-candle Gas, and 15 cwt. of superior Coke per Ton of Coal.

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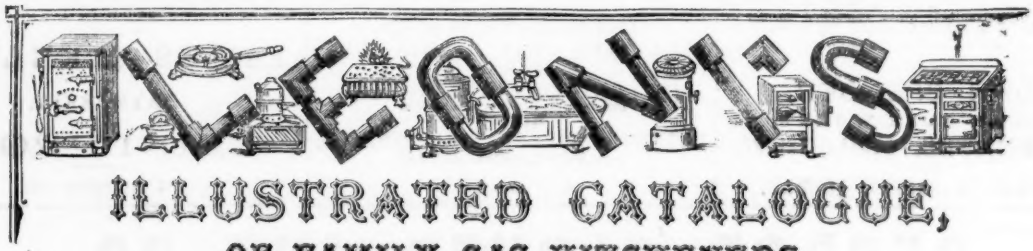

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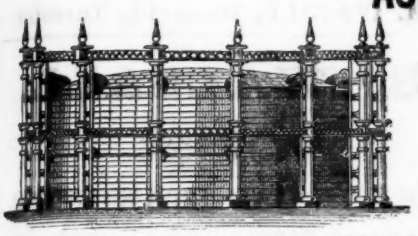
G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.



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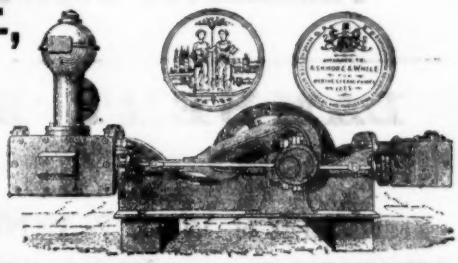

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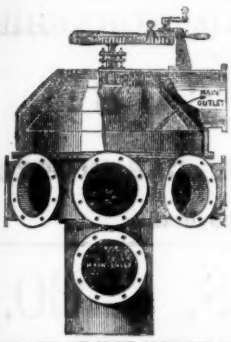
No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.



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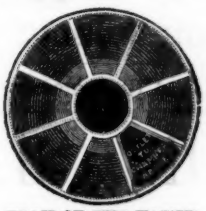

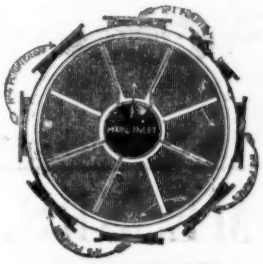

ELEVATION OF THE CENTRE-VALVE. PLAN OF THE VALVE. PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY.
LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,
And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

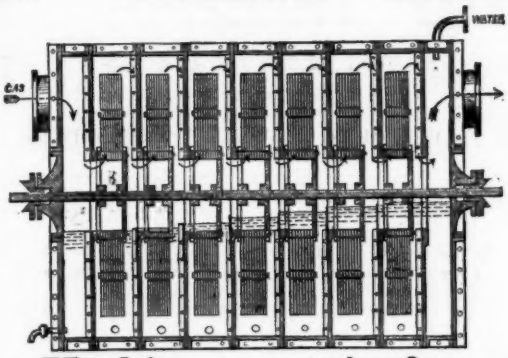
The advantages attending its use are—

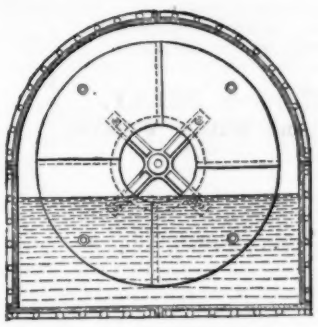
INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; **and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers.** That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

MESSRS. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3½	3	1½	1¼	½	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	¼	¼	0	10 „	78,000	Nil.	75°	61°	31°	28	26½	4½
„ 9	11	9	7	5	3½	2½	1½	1	½	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10½	8½	6½	5	3½	2½	1½	1	½	0	10 „	66,000	Nil.	76°	64°	28°	28	27	5
„ 11	12½	10	7½	5½	4½	3½	1½	1½	½	0	10 „	61,000	Nil.	73°	64°	27°	26½	25½	5
„ 12	11	8½	6½	—	—	—	1¼	¾	½	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10½	8½	6	4½	3½	2	1¼	½	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

MESSRS. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

MESSRS. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

MESSRS. KIRKHAM, HULETT, and CHANDLER. *Woolwich Equitable Gas Company, Engineers Office, Nov.* 1, 1879.

Gentlemen,—In answer to your inquiry respecting Washer erected here in September last, and which has been working here constantly since Oct. 1, I beg to say that it is working very satisfactorily. We sell over 24 gallons of 10 oz. liquor per ton of coal carbonized, and depend upon your Washer to extract all Ammonia, which it does satisfactorily, not leaving a trace of free Ammonia at the outlet. It takes little power to drive it, and the difference of pressure between inlet and outlet is scarcely noticeable, being less than half an inch. I consider it a very valuable machine, and have little doubt that it will pay for the outlay in a very short time. I shall be pleased to show it to any one that may be in want of such a machine, when they can see its capabilities themselves.—I am, Gentlemen, yours faithfully, (Signed) W. WHITE, Engineer.

MESSRS. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

MESSRS. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec.* 19, 1879.

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St., Westminster, London, S.W.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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MOBBERLEY & PERRY,
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Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,
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FIRE CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
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GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S
Patent Gas Calorigen,
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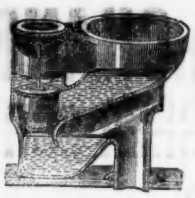

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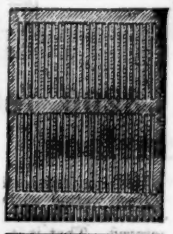
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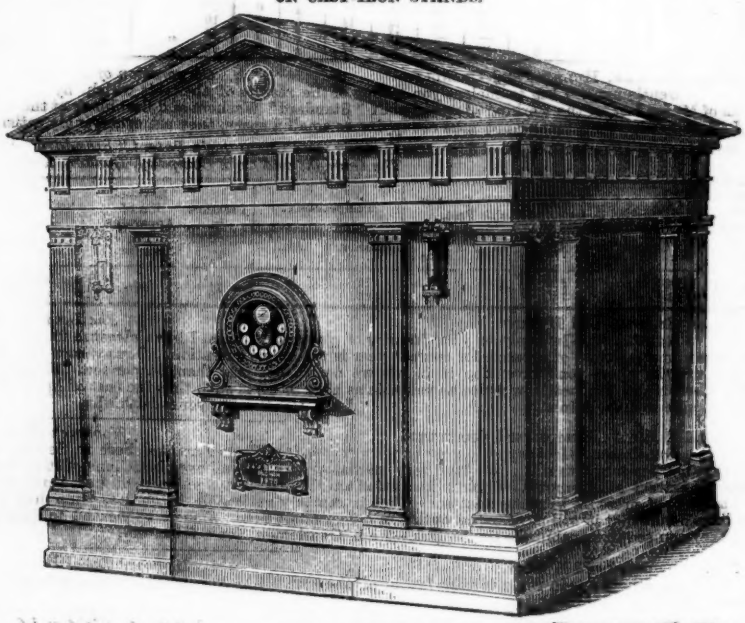

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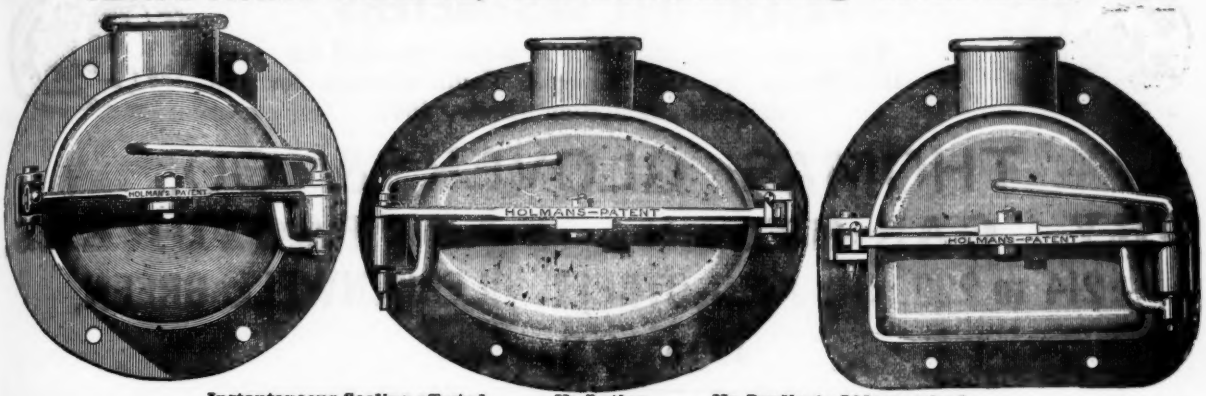


Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

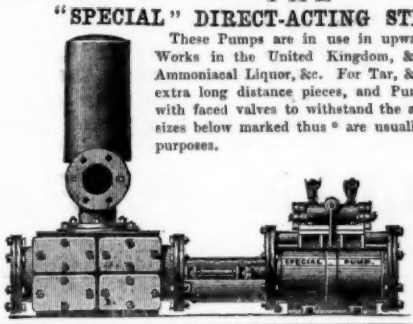
MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

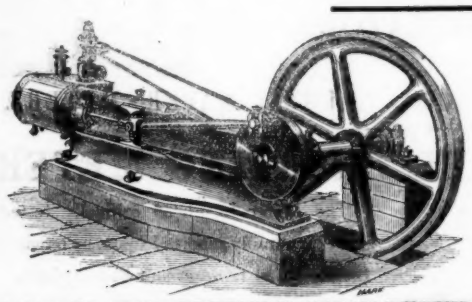
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.

These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.



The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1¼ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2¼ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



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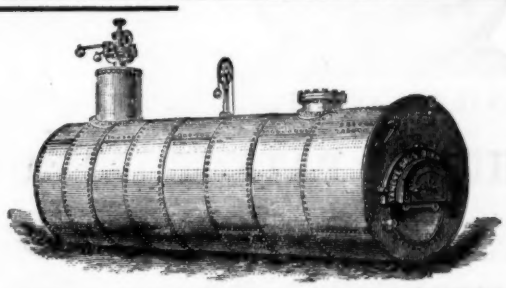
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



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Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES, And all other Descriptions of Tools, &c.

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London, 1851. New York. 1853. Paris, 1855. London, 1862.

Dublin, 1865.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

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3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
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8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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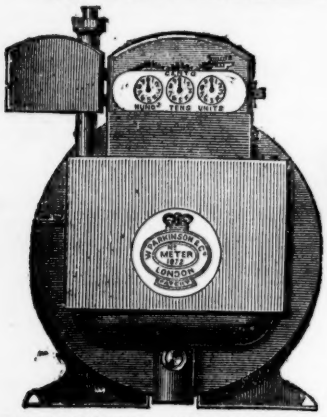
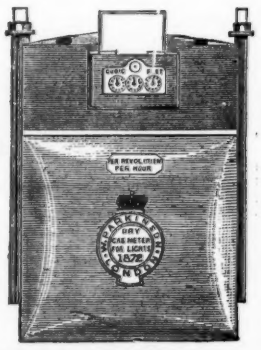


(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,



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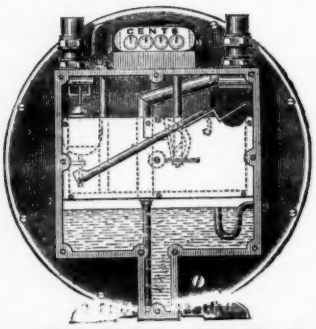

The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

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COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

E. M.—*A simple stamped receipt is quite sufficient.*

A. E.—*There are many gas and water works already established, some under companies and others under municipal control. To what town in the colony do you refer?*

FIRTH.—*Next week.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 18, 1880.

Circular to Gas Companies.

SHORT though the parliamentary session must be which commences its real work this week, it may yet prove of importance to the interests of Gas Companies. A reconsideration of the question of the Water Supply to the Metropolis is for many reasons probable, if not inevitable, and it will hardly be surprising if the subject widens so as to embrace the gas supply also. The present House of Commons, containing as it does so many new members with the proverbial disposition to work hard and thoroughly, is more likely to err in the direction of attempting too much than too little; and the task of reconciling the demands of ratepayers and consumers with the rights of shareholders in Metropolitan Gas and Water Companies has been so often attempted, and has so often failed—it has led to so large an expenditure of time and money and temper—that its accomplishment would be an achievement not unworthy of those "golden hours" from which so much is expected, and there are not wanting signs that the effort will be made. Whether the larger question of the reform of the Municipal Government of London, threatened or promised years ago by Mr. Gladstone, will not absorb and delay these minor matters, which may be regarded as fragments of that great whole, time will show. However this may be, it seems probable, having regard to the character and experience of some of the men now at the head of affairs, that any such inquiry would be conducted with a view to laying down lines that will serve not only to guide the relations of Metropolitan Companies with the Municipal Authorities, but which shall be applicable also in regard to similar questions as they may arise in the towns of the country generally.

As our readers are aware, *The Times* has lately been giving its attention to the question of electric lighting, and has passed through a period of tribulation because of the miscarriage of certain prophetic ventures as to the future relations of gas and electricity. Perhaps it is partly with the object of showing how baseless were the anticipations then expressed, and the panic which resulted from them, and also with a view to utilizing the information so painfully gained, that what is generally called the "leading journal" has now entered upon an inquiry or argument as to the propriety of the compulsory municipal acquisition of gas and water undertakings, and has treated the question so far without a word of reference to the competition—so formidable a few short weeks ago—of the electric light. Even we were scarcely prepared for such an evidence of the shallow and ephemeral character of the agitation then experienced. A letter signed "A Member of the Council of the Incorporated Law Society," published on the 13th inst., commences with the statement that "There is a well-founded desire and "growing necessity for Municipal Corporations to possess the "right of public supply of water and gas within the limits of "their districts." Our columns have borne abundant evidence of the truth of a moiety of this statement—viz., the "desire," the distinctly "growing" desire on the part of Municipalities to acquire gas undertakings, provided only that they are sufficiently prosperous. The *necessity* for such acquisition, and the principles on which the desire is said to be "well founded," are not so apparent. The desire may be said to have grown in intensity directly with the profits of the Gas Companies; and this explains a conspicuous anomaly in the proceedings of Municipal Authorities—viz., that it has been the successful and well-conducted Gas Companies which have been the objects of this most determined attack, rather than those where, from any causes, the success has been small, and the field for improvement proportionately larger. We distinctly question the *bona fides* of Corporations generally in this matter, believing that the object avowed—that of securing to the consumers a better and cheaper supply of gas—is, in the vast majority of cases, secondary to the purpose unavowed—of becoming traders with a view to the making of profit, and thus obtaining the advantage of increased revenue without the usual accompaniment of apparent increased taxation. We have repeatedly pointed this opinion by reference to the conduct of gas affairs in Manchester, Birmingham, and other towns similarly placed in this respect. Another illustration occurs to our mind in the case of the opposition offered this session, by the Corporation of Hanley, to the Bill of the British Gaslight Company. Hanley is one of the five or six towns constituting the Staffordshire Potteries, and all of them were at one time supplied with gas by the British Company. One by one these towns have started competing Companies, who have bought out the interest of the British Company, and, after varying periods of independent existence, have transferred their undertakings to the Corporations of their respective towns. But in each of these places the price of gas is maintained at the same amount as that charged by the British Company in Hanley, though each shows a balance sufficient to justify a reduction. The inference is a fair one—that should the Town Council of Hanley also succeed in obtaining possession of the gas-works the price of gas will not be reduced, but will at once be accepted as a fair and equitable one.

In Paris the Municipality are charged only one-half the price paid by private consumers of gas, and, still further, the Gas Company pay to the same authority a large sum annually, being an agreed proportion of the profits in excess of a given amount. This is an arrangement which would be impossible in any town in the United Kingdom. The political intelligence of the inhabitants would protest against so palpable an unfairness to a section of the community, and also against the direct inducement—which might almost be called a bribe—to those who are appointed to watch over the interests of all alike, to permit the overburdening of a part. Impossible as such an arrangement would be with us, where the supply of gas is in the hands of a Company, we fail to see any marked difference in principle between it and the system of municipal management of gas-works as usually conducted, where one section of the ratepayers may urge on a wasteful and oppressive expenditure, knowing that the money to meet that expenditure will have to come from other pockets than their own.

In the special article in which *The Times* deals with its correspondent's letter, and which is written all through in a tone and temper of great fairness, it remarks: "Where the "Municipality has the control of the water or gas supply, the "consumers obviously (?) enjoy all the advantages of co-

"operation." The converse of the truth of the matter could hardly have been more clearly stated, for, as we have shown, the profits of the business are distributed, not among the consumers who have contributed them—the true co-operators—but among those who have made no purchases, and whose only interest is to keep up prices, so that the balance of profit may be the larger.

The learned letter-writer makes some strong animadversions upon the conduct of the Private Bill business at Westminster, and supports them by a quotation from the late Mr. J. A. Roebuck, which appears to us greatly exaggerated. He suggests, as a simple method of reducing the expenditure of time and money, that "a general Act be passed authorizing "any Municipal Corporation to purchase any private under-"taking for the public supply of water or gas within its "district, provided that (1) a resolution be carried, at a special "meeting of the Corporation, by a prescribed majority of "votes; (2) that afterwards such resolution be confirmed by "a majority on a poll of the ratepayers. After two such "resolutions, let the Corporation become entitled to purchase, "and the Company to sell the undertaking; let six months "be allowed for negotiation for an amicable transfer, and, failing "an agreement within that period, or within an extended time "to be granted in a prescribed manner, let the undertaking "be taken over on terms to be fixed by reference to a proper "tribunal for arbitration." *The Times* mildly remarks upon this outrageous proposal that "it would be a somewhat heroic "remedy, and open to the charge of injustice which usually "attaches to an *ex post facto* law." It concludes its article, however, as follows:—"The time now seems to have come "when Parliament itself should recognize practically, in its "work of private legislation, as it has recognized in the "abstract by public statutes, that the supply of gas and "water, affecting as it does so materially the health and "comfort of every community, should, as a general principle, "be given to Local Authorities, where these desire to under-"take it, and can show that they have the ability and the "means to do so. A compulsory purchase clause at the option "of the Local Authority should form part of every Act con-"stituting a Gas or Water Company."

Parliament is, of course, at liberty to insist on such a condition in the Act of any Company yet to be incorporated, and it would rest with such Company to say whether they would accept the responsibility of proceeding upon such terms, the Local Authority being at liberty to avail itself of some period when, from any cause, the value of the property was depreciated, to press the purchase; but the proposal to apply such a rule to existing Companies is simply absurd. Gas Companies freely acknowledge their obligations to the public, but they claim also that they do not exist *simply* for the benefit of that public. They have undertaken and performed certain duties of acknowledged value, and have received in return privileges and rights which are theirs to hold absolutely so long as they continue to render faithfully the services they have thus undertaken. *The Times* remarks that while many recent Acts contain clauses providing for the purchase by Municipalities, in the earlier Acts they are very seldom present. The reason for this is so obvious, that we wonder it did not occur to our contemporary. In those earlier days, when difficulties were many and dividends small (if not wanting altogether), there was no inducement to the exercise of that superior management in which Corporations are now confident, and the proposal to become gas manufacturers would have been resisted alike by ratepayers and the Legislature. This explanation is, indeed, given later on in the same article, where it is remarked: "In considering the "question of the justice of compulsory purchase, it is impos-"sible to ignore the rights of the proprietors of existing "Companies. They have invested their capital with risk of "depreciation or of total loss; by dint of economical manage-"ment they have conducted their enterprise to a point where "it begins to be a lucrative concern; and it seems harsh that "a municipal body, which would have nothing to do with "them in the hour of danger, should swoop down on them in "prosperity, and exercise an option of purchase." Such is the view which Parliamentary Committees have taken hitherto, and will, we believe, continue to take, of all such confiscatory proposals as that of *The Times* correspondent; and Companies with whose management reasonable fault cannot be found may rest content that they will not be called upon to part with their property except on terms acceptable to them.

We are surprised that our contemporary seems unacquainted with those important features of modern gas legislation, the auction clauses and the sliding scale, a knowledge of which would probably have satisfied the writer that at any rate in the future "a statutory limitation of the dividends "of Companies in the public interest" is not likely to be "evaded by unnecessary additions to capital;" but to this point we shall return in our next issue.

While we deplore the growing tendency towards the acquisition of gas undertakings by Municipal Authorities, we do so more in the interest of the consumers than in that of the shareholders. The latter will only surrender a profitable business for an adequate consideration, while the former will have to bear the evils attendant upon a monopoly practically unregulated, and a service wanting in the spirit and vitality which are inseparable from personal interest.

The members of the Southern District Association of Gas Engineers and Managers had a pleasant meeting on Thursday last at the Crystal Palace District Gas-Works, Lower Sydenham, where they were received by Mr. Gandon, the Engineer of the works. Before the regular business of the meeting was begun, the Chairman, Mr. J. Hunter, of Woolwich, performed, on behalf of the members of the Association, a graceful act, in presenting a testimonial to the Secretary, Mr. J. L. Chapman, in recognition of the services which he has rendered in that capacity; and no one who estimates the work of such an office at its proper value will be disposed to cavil at the honourable acknowledgment which Mr. Hunter and his *confrères* have made of the appreciation in which they hold Mr. Chapman's manner of discharging his secretarial duties. The business of the meeting consisted solely of a paper by Mr. Gandon on "Condensation," which was followed by a somewhat conflicting discussion, as always happens when this highly interesting but vague question is under consideration. As the condensing arrangements of no two gas-works are precisely alike, or by differences of situation are not comparable one with another, there is always plenty of discordance between the views of Gas Managers respecting them. We would suggest that this matter is further complicated by the assumption so frequently made that the dimensions of all condensing plant are demonstrable in terms of superficial area to amount of gas passing through in a certain time, without reference to the varying conditions under which the work has really to be done. Let it be generally accepted that a condenser cannot fairly be measured, like a gasholder or meter, the value of which is only a question of measurement and nothing more, but must be considered as a machine to be specially designed for the place it has to fill, and a good deal of preliminary mystification would disappear.

The instructive trial of new forms of street-lamps and powerful burners, which has just terminated at Birmingham, and the main results of which were published in our last week's issue, has, we are informed, led to a decision on the part of the Corporation to set up a large number of globular lanterns with Bray's flat-flame burners, for lighting some of the more important open spaces and street crossings in the borough. The competition was conducted on strictly equitable terms for all the lamps engaged, and practical convenience was particularly considered in arriving at a final opinion respecting their relative value. Mr. Hunt, the Engineer to the Corporation, under whose direction the trials took place, deserves the thanks of those interested in the result, for the promptness with which he has placed before the gas world the very valuable series of diagrams we presented to our readers last week, thus permitting free examination of the grounds upon which he formed his own judgment. Nothing can be more valuable in the interests of scientific research than the compilation of data in this independent manner. The diagrams leave nothing to be desired on the score of completeness, but we regret that circumstances prevented Mr. Hunt from going rather more fully into the description of the experiment than he did at the recent meeting of the Midland Association of Gas Managers, which, however, he may have considered sufficiently explained by the action subsequently taken by the Gas Committee of the Corporation.

At the quarterly meeting of the Stafford Town Council, held on the 4th inst., the Gas Committee had a favourable report to present of the works under their control. The price of gas and coke has been reduced during the past year, but the gross profits still amounted to £5413 7s. 9d., and after paying interest due on loans, and income-tax, there remained a net balance of £2056 13s. 4d. Of this, the sum of £1500 has been handed over to the district fund, so far helping the rates, leaving a handsome balance in hand. The only work which was proposed by way of extension was a tar-tank, a considerable amount of main-laying and renewing having been done during the past year. In moving the adoption of the report, Alderman Cox referred in appreciative terms to the good management of their Engineer (Mr. Storer), to whose care is so largely due the gratifying circumstance

that the disposable profits on last year's working were equal to those of the previous year, notwithstanding the reduction in price. Progressing at this rate, it will probably be found that a still further reduction will be possible at no very distant date from the present time.

The Mold Local Board are sorely exercised in mind respecting the quality of the gas supplied to that historic locality, and the price the Company charge for it. It is curious to see, in the utterances of discontented gas consumers or their representatives, how the human mind tends to run in grooves. For instance, in this little Welsh town we find the same belief expressed respecting the nefarious practice of the Gas Company in mixing air with their gas as we invariably find everywhere else, when consumers are dissatisfied with the amount of their gas bills. In this instance an inquiry by a Special Committee was directed to lay bare the sins of the Gas Company, and, we presume, among other things, to discover the air-pump. A speaker referred to the extraordinary fact that a reduction in the price of gas did not always cause a diminution in the amount of the next quarter's gas bill. We might suggest to the gentleman's mind the reflection that if it did, reductions would not be so frequent as they are. This complaint is nothing more than the gas consumers version of the proposition that lowering the price of gas invariably leads to its increased consumption, and this is an ascertained truth which Gas Companies and their consumers ought to congratulate each other upon, and not get to loggerheads about. The Mold Local Board and the Gas Company should come to an amicable understanding about the points in dispute, when, if both parties explain their position in a proper manner, the grievances that are now complained of will probably be found very susceptible of alleviation.

It is not often now-a-days that we find a Gas Company charged with polluting a river with "gas-washings," but this was the cause of trouble between Colonel Stansfield and the Yeadon and Guiseley Gas Company, and which resulted in an action tried at the last Yorkshire Winter Assizes at Leeds, and further reserved for consideration of some points of law. As will be seen from the report in another column, judgment has been given against the Company. Into the merits of the case we will not now enter, but the chief point which Justice Lush had to settle was the true meaning of a clause of the Public Health Act, 1875, which enacts that the penalty provided for fouling water by gas refuse may be recovered "by "the person into whose water such washing or other sub- "stance is conveyed or flows, or whose water is fouled" thereby. The water fouled was in this case a running stream of which the plaintiff was only riparian proprietor, having property on the banks, but no exclusive right to the stream; and the Gas Company contended that he was consequently not a person "whose water was fouled" in the meaning of the Act; or, if so, every riparian proprietor along a river might proceed against a Gas Company for a single offence. Justice Lush, however, held that the plaintiff was entitled to recover, stating that the first person who took proceedings in such a case of multiplicity of sufferers by a single offence was alone entitled to the penalty. This, as will be seen, is an important precedent affecting Gas Companies, although nothing but accident could be held to palliate the occurrence of such a cause of offence.

Mr. S. Hunter, of Salford, has the courage of his opinions. He has refused a considerable increase of salary, offered him unanimously by the Gas Committee of the Salford Corporation, on the ground that the Committee were not in accord with the entire body of the Town Council in making the offer. It seems almost Quixotic to defer so completely to a minority, some of whom might perhaps find the fact of any course being recommended by some of their colleagues sufficient justification for rejecting it. But Mr. Hunter has followed the same line of conduct on a previous occasion, and in noting his repetition of an act of such self-denial, we may express the hope that his scrupulousness may not be called into action again.

Some few weeks back we stated that the Manchester Corporation had decided on appointing an Engineer-in-Chief over their various works of manufacture and distribution. We have now the pleasure of informing our readers that Mr. J. West, of Maidstone, has been selected to fill the important position. From the peculiar circumstances of the case, the appointment will prove anything but a sinecure; but Mr. West is no stranger to Manchester, where he has already made a reputation by the improvements which he has introduced into the carbonizing department at the Rochdale Road station. The construction of the new works at Bradford Road, now in progress, will naturally offer a wide scope for Mr. West's energies, in dealing with which, and the other portions of this great undertaking, he will, we have no doubt, further heighten the estimation in which the Gas Committee hold his services. We understand that twenty-one applications for the appointment were received; but that the question at last resolved itself into a choice between four gentlemen—viz., Mr. West; Mr. G. E. Stevenson, of Peterborough; Mr. R. O. Paterson, of Cheltenham; and Mr. W. Romans, of Sheffield.

The Paris season is going to be signalized this year by a competition of three systems of electric lighting in the illumination of the Opera House, within and without. M. Garnier, the Architect, has been charged by the Government with the investigation of the respective qualities of these rival systems, which, we understand, are to be the Jablochkoff, or "candle" arrangement; the Werdermann, which is an incandescent burner; and the Lontin-Mersanne carbon light. We should have thought the French Government had had ample experience of the Jablochkoff light during the prolonged use of it in the Avenue de l'Opéra; but, at all events, they seem to want to subject it to further trial. The Paris Gas Company have worthily stood up for the advantages of gas for producing effective illumination, by lighting the adjoining thoroughfare, the Rue du Quatre Septembre, with their new gas-lamps; but these are not to be admitted into the projected competition, on grounds of which we fail to see the sufficiency. The heat developed in the combustion of so much gas is held to be a fatal objection to its use inside the Opera House; but this is a drawback which ventilation should be competent to reduce to insignificance, or, if found insuperable, it might be allowed a certain value in estimating the comparative merits of gas and electricity, or the peculiar colour of the latter might be set off against the heat of the gas. In any case, it is to be hoped that the Architect will not lose sight of the circumstance that people will not go to the Opera to see a brilliant system of artificial illumination, however grandly it may show up the magnificent decorations of the building which contains it, but to hear and see what is going on around them and on the stage. We have heard it whispered before now that the grandeur of the structure itself, and its architectural embellishments, rather detract from than add to its value for the ostensible purpose for which it was designed, and we hope this complaint will not be uttered still more loudly, if a too refulgent glitter of light in the auditorium causes the modest footlights to "pale their ineffectual fires." Of the three systems indicated for comparison, the Lontin-Mersanne is held in some quarters to be the most reliable; but we shall wait with much interest the publication of M. Garnier's report on the whole subject.

It is with much regret that we announce the death, on Thursday morning last, of a gentleman who has long been connected with the JOURNAL—Mr. W. T. Fewtrell, F.C.S.—and who, in conjunction with Mr. T. Newbigging, edited the first and second volumes of "King's Treatise on Coal Gas." Born at Farnham, in Surrey, in the year 1822, Mr. Fewtrell passed through a very varied experience in the course of his life, and was in many respects a most noteworthy man. His education was commenced under a nephew of the celebrated William Cobbett, and finished by the Rev. William and Cyrus Blandford; after which he went as apprentice to a chemist—a Mr. Lunn—in Aldersgate Street. Before, however, he had completed his term of service, Dr. Pereira obtained for him an appointment as Dispenser at the London Hospital, which position he held for some years. He next was sent out by Government, during the Crimean campaign, as Dispenser at the Smyrna Hospital; but was soon ordered to the seat of war, and was one of those who entered Sebastopol the day after it was taken, on which occasion he had a narrow escape of being killed by a stray shot from the enemy's cannon. On his return to England he went back to the London Hospital as assistant to the late Dr. Letheby, and then commenced his literary pursuits, which he continued to the time of his death. He at one time was sub-editor of the *Chemical News*, but ceased his connection with that paper on commencing his writing for the JOURNAL—having been introduced to the late Mr. T. G. Barlow by his friend Dr. Letheby. On this latter gentleman's death, Mr. Fewtrell acted as Chief Gas Examiner for the Metropolis, pending the appointment of Professor Williamson by the Board of Trade; and he kept up his connection with the gas profession to the very last. Though he had been in an enfeebled state of health for some few months past, his death was quite unexpected, as he was completely laid aside for only three days before his decease, which, as already stated, occurred last Thursday, from congestion of the brain.

Water and Sanitary Notes.

A SIGNIFICANT sign has been made by *The Times* within the last few days. With Mr. Chamberlain in the Cabinet, as President of the Board of Trade, it might be predicated that projects for the transfer of water and gas undertakings from private companies to public authorities would rise into prominence. The influence now at work is shown by a letter in *The Times* of Thursday last, from "A Member of the "Council of the Incorporated Law Society," residing at Sheffield. This letter proposes a radical change in the system of Private Bill legislation, which is declared to be, as it now exists, "a scandal to the age." The end proposed is that of giving the Local Authorities greater opportunities for getting the water and gas supply into their own hands. Side by side with this letter was a special article in *The Times*, having all the phraseology of a "leader," though not appearing in the leading columns. The writer of this article, whoever he may have been, though not going so far as the writer of the letter, went far enough to argue that Parliament, in its work of Private Bill legislation, should henceforth act on the principle that the supply of water and gas should, as a general rule, "be given to "Local Authorities, where these desire to undertake it, and "can show that they have the ability and the means to do "so." Thus, we are told, "a compulsory purchase clause "at the option of the Local Authority should form part of "every future Act constituting a Gas or Water Company." The commencement of *The Times* article is particularly significant, and must be taken as showing its aim. It says: "The question of the Water Supply of the "Metropolis, however it may be settled, is only a part, "though an important part, of a much wider issue really "affecting the whole country." The next sentence states the issue thus: "It has become the business of the Legislature to "decide how far it is fair, and how far expedient, to compel "Companies which supply the public with necessary com-"modities like gas and water, to sell their undertakings to "local and municipal bodies." The subject is adverted to again in the first leader in *The Times* of Friday, where the question is opened up by referring to the interview between the Commissioners of Sewers of the City of London and the Home Secretary. "As was pointed out yesterday in our "columns," says *The Times*, "the absence of any clause in "Water and Gas Companies Acts securing the right of pur-"chase, under fixed conditions, for Local and Municipal "Authorities, has allowed vested interests to grow up un-"checked, and they will continue to grow unless they "are extinguished by special legislation." The growth here adverted to is not merely an increase in the number of such Companies, but the development of those that already exist. It was the complaint of the Sheffield writer that the existing Companies possessed statutory powers which enabled them to lay such burdens on the consumers as "threatened to become intolerable." From this point we find *The Times* going on to argue, on the question of purchase, that "five years hence, should the Water Com-"panies of London still retain their chartered privileges, the "price to be paid will be found to have increased enor-"mously." The main line of the editorial argument is favourable to Sir Richard Cross's Bill, and it is suggested that if the terms of purchase were settled, as some propose, by arbitration, "the ratepayers may have to pay, under the "award, a heavier price than that to which Sir Richard Cross "agreed." The fact that the provisional agreements with the Companies are in force until July is strongly insisted upon, and the desirability of something being done in the meantime "to secure an amicable arrangement" is very clearly suggested. But the most important feature of the whole affair is that which shows the commencement of a movement for hastening the transfer both of the gas and the water supply throughout the country from Companies to the Local Authorities.

The Metropolitan Water Question is a perilous subject for some people. Even Sir William Harcourt, as Home Secretary, shivers on the brink of this troublesome controversy. It was the motto of Lord Aberdare, when holding the office now possessed by Sir W. Harcourt, to keep all sorts of difficult subjects "under consideration." The present Home Secretary adopts a different plan, he seeks for "information." It was with this weapon that he parried the approach of the City deputation last Thursday, when the Commissioners of Sewers sought to learn what the Government intended to do with respect to the Water Supply of the Metropolis. To interrogate a new Home Secretary sa to the intentions of the Government with respect to a critical matter, just on the eve of the Royal Speech, would seem a little premature. Sir William had no story to tell, which was not to be wondered at; but neither had the deputation anything to say, which was the more remarkable. They thought the Bill of the late Government was dead and done for, and they had never deemed it worth their while to come to any decision upon it. Evidently the Home Secretary took a different view of the case. He made use of expressions which showed that, in his opinion, the Bill brought in by Sir Richard Cross was one which deserved further consideration. He went so far as to advise the Commissioners to examine the provisions of the Bill, both with regard to the terms of purchase and the constitution of the Water Trust, so that they might come to him with a clear statement of their views on a future occasion. On the whole, Sir W. Harcourt behaved wisely. Being asked whether the Government would introduce a Bill to prevent the charge for water being raised in accordance with the new assessment, he replied: "The Companies, as I understand, have a right to "charge for water upon the annual value of a house; but that "is a matter of law which does not actually ensue upon the "assessment." Not a word of condemnation with respect to Sir R. Cross's Bill fell from the lips of Sir W. Harcourt. "I wish to regard these matters quite impartially," said the Home Secretary, "and neither to adopt nor to condemn any "particular scheme for taking over the Water Companies." He suggested that perhaps the Commissioners would prefer that the Companies should be taken by arbitration. "Really," said Sir William, "the responsibility, as it seems to me, rests "chiefly with those who are principally interested." The deputation promised to learn their lesson, and say it next time. The next day the City Remembrancer wrote to the papers to say that, in the published account of the interview with the Home Secretary, he was "made to appear to have overlooked "the fact that the Corporation of London, and not the Com-"missioners of Sewers of the City of London, are the "Metropolitan Authority for the purposes of the Metropolis "Water-Works Act, 1871." The City Remembrancer, of course, means the Water Act, but the meaning of his letter, on the whole, is not quite clear, except it be a roundabout attempt to set matters right on a question of precedence between Gog and Magog.

The following announcement appeared in the *Journal of the Society of Arts* last Friday week:—"The Council have decided "to summon a public Conference, to consider the question of "supplying London with pure water." This is what might have been expected. But, according to Lord Palmerston, it is the unexpected that comes to pass, and last Friday the Society's hebdomadal organ contained a notification that the Council had resolved "not to summon the conference." It appears that the authorities of the Society "have confidence "that the supply of the best water to the Metropolis will be "fully considered by Her Majesty's Government at an early "period." Hence the conclusion that "no Conference should "now be held." Such a "flash of silence" at the Adelphi we cannot do otherwise than look upon as one of the most striking incidents of the water controversy.

The Metropolitan Municipal Association has been holding a meeting of its members to debate sundry important questions, and has appointed Sir Ughtred Kay-Shuttleworth as its President. Mr. Firth, M.P., has been requested to take charge in Parliament of the several reforms advocated by the Association. A series of resolutions on London Government has been agreed to, and copies have been sent to Sir W. V. Harcourt, but it has been judged proper to defer publicity until the Government has had an opportunity of declaring its intentions. It is, however, made known that in the opinion of the Association "it is desirable that the Government "should take measures to protect the interests of the rate-"payers" in respect to the Metropolitan Water Supply, and, while providing for the acquisition of the works and property of the Companies on behalf of the ratepayers, "should secure "an increased and purer supply." After the meeting of Parliament, it is contemplated to seek an interview with the Home Secretary. "A strong opinion was expressed" at the meeting of the Association "that the Queen's Speech would "deal with some of the questions under consideration." Mr. Watherston was elected Chairman of the Executive Committee and Treasurer, and Mr. Beal was requested to continue to act as Honorary Secretary. On Thursday we shall have the pleasure of knowing how far the Queen's Speech is likely to agree with the expectations of Mr. James Beal and his friends.

The Rochdale Corporation Water-Works are as yet a long way from being a paying concern, although the rental shows a steady increase during the past year. The gross amount of

the water-rate for the year was £19,716, as against £18,748 during the year previous. If from these figures the allowances for unoccupied property, &c., be deducted, which amounted to £807 last year, against £434 for the year before, the net increase is shown to be not quite £600. The interest for the year upon works, in progress and completed, amounted to £15,180, and the loss on the year's working was as much as £8600. Up to the 25th of March last, the cost of the Cowm Brook reservoir had been £281,303, and that at the Spring Mill, £121,630. It should be noted that the price of water is the same to consumers within and without the borough, while the former are rated at ninepence in the pound to make up the deficiency.

Among the notable events of the past week has been the delivery of the award of the Arbitrators in the case of the Conservators of the Thames against the Metropolitan Board of Works. It was alleged by the Conservators that the main drainage outfalls at Barking Creek and Crossness Point had created mud-banks obstructive to the navigation, and they required that the Metropolitan Board should be called upon to remove these banks by dredging, or bear the necessary expense. The Metropolitan Board, on their side, denied that the outfalls caused any obstruction, and therefore repudiated all liability with regard to dredging. The dispute has been a costly one, but the result is satisfactory for the rate-payers, seeing that the decision of the Arbitrators, endorsed by the Umpire, is wholly in favour of the Metropolitan Board, thereby setting aside any plea—so far as the navigation is concerned—that a few more millions ought to be spent in order to carry the sewage a greater distance down the river. It will be remembered that the Umpire in this case was Sir Charles Hartley, and the Arbitrators for the Conservators and the Metropolitan Board were respectively Captain Douglas Galton and Mr. F. J. Bramwell. Able counsel appeared on either side, forty-one witnesses were examined, and the case occupied twenty-five days, distributed over several months. The unanimity of the award is certainly contrary to general expectation, especially considering its absolute terms. That Captain Galton should thus exonerate the outfalls, and sign an award which declares that each of the three mud-banks in question "has arisen from "the dredging operations carried on by the Conservators or "sanctioned by them," is a remarkable proof that the evidence adduced by the Metropolitan Board was of a most conclusive character. We regret to learn that Mr. Keates, the Consulting Chemist to the Board, whose scientific investigations in connection with this matter were so valuable in themselves as well as in relation to the inquiry, has been seriously indisposed since the close of the proceedings, though now at last convalescent. It remains to be observed that the case brought forward by the Conservators referred solely to navigation, and therefore had no direct reference to sanitary considerations. It is understood, however, that the Metropolitan Board feel quite confident as to their ability to fight the question of pollution as well as that of obstruction.

Influenced by the outcry of grossly defective drainage in connection with West-end mansions, an organization is being set on foot entitled a "Society for the Sanitary Inspection "and Construction of Houses, Limited." It has Dr. Lory Marsh for one of its Directors, and Major Flower, Consulting Engineer to the Lea Conservancy, for its own Consulting Engineer. It is modelled in some degree on the same basis as the Edinburgh Sanitary Association, the members of which pay a small subscription, and this entitles them to have their houses inspected at least twice a year by the Engineer of the Society. The subject, as our readers are doubtless aware, has been made prominent of late by several letters and articles in the *Standard*. But this is not the first time that certain high-class West-end dwellings have been laid under suspicion with regard to their sanitary arrangements.

We share with our contemporary, the *Lancet*, in a feeling of satisfaction at the circumstance that the new President of the Local Government Board has a seat in the Cabinet, thus virtually creating a Ministry of Health. It is pointed out that "in all, some six thousand five hundred members of the "medical profession are engaged in scientific work carried "out under the authority of the department whose head is "now a Cabinet Minister." The somewhat contradictory views expressed in the House of Commons by the late Home Secretary and his colleague at the Local Government Board will not be likely to find a counterpart when both these high officers of State take partin the deliberations of the Cabinet. The business of the Local Government Board, especially in relation to the passing of Provisional Orders, will also be promoted by this new arrangement.

EFFLUVIUM NUISANCES.

Third Article.

After having described the process of carbonizing coal in the retorts, Dr. Ballard devotes but few words to the description of the condenser and exhauster, as the operation of neither of these important divisions of gas-making apparatus comes within the range of his inquiry. The next process, therefore, to which he gives especial prominence is that of washing or scrubbing the impure gas with water. He briefly summarizes the principal impurities which coal gas contains previous to the commencement of its treatment for purification, some of which, such as the sulphur, ammonia, and the cyanogen compounds, are, as he says, valuable in themselves, and should, if possible, be recovered, although the last impurity has had but little practical attention paid to it. The purifying materials most commonly employed are water, lime, and hydrated oxide of iron, with a few other compounds in limited use. In washing or scrubbing, water only is used. The number of gas-works where the gas is scrubbed is in excess of those where it is washed only, or washed and scrubbed, although Dr. Ballard omits to define the two classes of apparatus with sufficient exactitude. He records a general expression of preference for Mr. G. Anderson's washer, describing its action as making the gas bubble up through a series of shallow trays —a description which would also apply to Mr. G. Livesey's washer, which is not mentioned, and, strangely enough, Anderson's scrubber is also not alluded to. Dr. Ballard mentions Mann's and Livesey's scrubbers as being most generally used, referring also to the occasional use of drain tiles instead of coke or thin boards. Respecting the process itself, however, he notes that the same condition must be maintained in order to secure proper results, whatever system be adopted, which is that the scrubber be not stinted in height, so that plenty of time be given for the solvent action of the water to take effect, the gas being kept in contact with it long enough to part with all that water can possibly take up. An illustration and full description of Kirkham, Hulett, and Chandler's washer is given, and its successful action in several works is commented on. With this Dr. Ballard closes his account of the present state of gas purification by water, and plunges into the greatest question of all, from his point of view —the purification of gas, properly so called, from its sulphur impurities, in connection with which arises the greatest effluvium nuisance that gas-works commonly send forth.

Dr. Ballard commences with a description of the wet lime process of purification, which, although generally abandoned, he found still pursued at the old Nottingham Gas-Works, and he might have said at one or two other old-established works. At Nottingham the cream of lime, after having become foul, is run into subsiding-tanks, the supernatant water from which is evaporated in the furnace ash-pans, while the deposited paste is used for luting the retort-lids. Dry lime and oxide of iron purification are then described in detail, and the chemical action which take place when foul gas is passed into a lime purifier is explained as a simultaneous combination of the lime with the carbonic acid and sulphuretted hydrogen of the impure gas, the products being carbonate of lime, sulphide of calcium, and water. After a certain time the sulphide of calcium first formed is again decomposed by the carbonic acid of the gas, the sulphuretted hydrogen being disengaged, until all the lime has become a carbonate, and thereafter inert as a purifying material. The sulphuretted hydrogen may be arrested by oxide of iron, and the sulphur remaining in the form of bisulphide of carbon may be taken out of the gas by passing it through sulphide of calcium, with which this last impurity forms a sulphocarbonate. In some works sulphate of iron is used instead of oxide of iron, and this has the advantage of separating ammonia as well as sulphuretted hydrogen; but, of course, the purifier is the wrong place to receive ammonia. Chloride of iron is used with the same object. Sawdust, unmixed with anything else, is used at Edinburgh to retain ammonia, and in some instances the sawdust is previously saturated with strong sulphuric acid, in which state it is known as "ammonia material." But all these substances, as well as other means of getting rid of ammonia, are quite superfluous when good previous washing or scrubbing is carried out, although Dr. Ballard considers something of the kind as useful to have at hand in case of accident to the scrubber.

And now comes the consideration of that part of the necessary work of purification which must, metaphorically speaking, have made Dr. Ballard straighten himself up for the task before him; we mean the removal or treatment of the spent purifying material, which terminates the investigation as far as gas-works are concerned. When purifiers are situated on the ground floor, the spent material must be thrown out over the side, and wheeled away in barrows; but in many large and newly-constructed gas-works the purifiers stand on an elevated stage which leaves a clear chamber below. The pipes connecting the purifiers pass along the roof of this chamber, and the spent material can be discharged through the ordinary outlet-box or pipe of the purifier when it is shut off by a valve from the general system, an opening being in this case provided in the horizontal outlet-pipe, exactly opposite and below the vertical outlet-box of the purifier. This opening is closed by a blank flange when the purifier is in use, but when required as a shoot for the spent material the flange can be removed, and a clear passage is then given from the interior of the purifier to the floor below. The spent lime is usually heaped up somewhere in the yard to await removal, the foul oxide being subjected to revivification by exposure to air, when it may be used again.

Entering into a statement of the cause of the nuisance arising from emptying purifiers, Dr. Ballard says that when lime has been thoroughly converted into carbonate before removal from the purifier, little or no nuisance can arise from it; but, of course, this is not often

the case, more or less of volatile sulphur compounds are always given off when the lid of a purifier is raised. But the nuisance, such as it is, is likely to be serious only when the previous operations of washing and scrubbing have not been properly performed, or when the lime is thrown out in the form of impure sulphide, as it must be when the removal of bisulphide of carbon from the gas is insisted upon. The nuisance is sometimes spread over regions where it would not otherwise extend, by the careless removal of foul lime in carts. In country works, where oxide purification will satisfy the law or popular demand, and where a single lime tray in the bottom of an oxide purifier will generally suffice to remove all that is necessary of carbonic acid, if the scrubbing is properly done, Dr. Ballard is of opinion that no effluvium perceptible beyond the boundaries of the works themselves can arise from the process of purification. But as lime must in many cases be employed as the chief or sole purifying agent, and as it must in such cases be removed, often in a highly odoriferous condition, after its work is done, it becomes of considerable importance to find out the best method of doing this, so as to confine the nuisance to the smallest possible area.

This question, we are bound to say, Dr. Ballard leaves pretty much as he found it. He says, indeed, that the plan of shooting the foul material down the purifier outlet, transformed for that purpose into a shoot, into closed carts or trucks below—the space between the opening under the purifier and the truck being made good with a channel or funnel of sacking, so that the material is not exposed to the air in its course—appears fairly sufficient to meet all requirements; but following Mr. M'Minn, of the Fulham Gas-Works, he gives a lengthy description, with three photographs, of the system carried out there, which Mr. M'Minn prefers, on the score of its disturbing the material less. In this system the whole surface of the material as it lies in the sieves is first watered with a hose, to prevent the possibility of dust arising from it, and covered with large sheets of sacking. Two workmen then proceed to remove the material, unrolling the sacking cover as they clear the sieves before them, and filling sacks with the foul material, which sacks are carried away by attendant labourers, and their contents shot into iron waggons, provided with sacking covers. These waggons are further sheltered while being loaded by a travelling wooden shed. When loaded the waggons are run out from the shed, and are drawn alongside the wharf, where the barge that is to remove the foul lime lies moored. The barge is loaded regularly, commencing at one end, over which a shed, hinged to the edge of the wharf-wall, is lowered, so as to practically enclose that end of the hold. The waggon to be discharged is drawn up opposite this sheltering shed, and is there covered by an extinguisher-like cover of sacking, while its load is emptied through the bottom, down a shoot into the covered hole of the barge, where, as soon as it reaches the proper level, it is covered with earth, and the barge when loaded is sent down the river to Beckton. Thus the whole process is done under cover, and inoffensively, so far as Dr. Ballard observed.

This complicated system of wooden and sacking covers, sheds, and extinguishers, is doubtless less formidable in reality than Dr. Ballard's minute description of it would lead one to think; and as it appears to satisfy those for whom it was constructed, no one need find fault with it, especially as Dr. Ballard does not say anything as to the advisability of copying it for other places. In short, it probably answers its purpose fairly well in the particular circumstances of the case; but as the essence of the arrangement really lies in the readiness of the means by which the stuff is cleared off the works, the simpler plan before described would appear to work equally well, provided the means of final removal were as convenient.

Dr. Ballard observes the failure of all attempts at deodorizing the foul lime before removal from the purifiers, not so much on account of any difficulties connected with the treatment of the material itself, as from the offensive gases produced in so doing, and the danger of explosions when these gases have been burnt up, which is the only way of finally disposing of them without causing a fresh nuisance. Dr. Ballard does not mention the proposal to revivify spent lime, of which he must, therefore, have been unaware, as he thinks it of importance that the attention of chemists should be directed to the discovery of some other agent than lime for the removal of bisulphide of carbon from gas. In connection with this part of the question, Dr. Ballard merely mentions in passing the process of Mr. Leigh, of Manchester, which consists in the use of gas liquor converted, by a process of distillation or otherwise, into sulphide of ammonium, which, on addition of excess of sulphur, readily absorbs bisulphide of carbon with deposition of the excess of sulphur. But this process was not sufficiently perfect to be continued at the Manchester Gas-Works, where it was attempted to adopt it. Another process mentioned is that of Mr. W. Marriott, of Huddersfield, who uses sulphide of sodium specially prepared, which Dr. Ballard saw in course of trial at the Bromley Gas-Works. So that, respecting the great question of the prevention of nuisance from lime purifiers, Dr. Ballard has no specific remedy to recommend for general adoption, and his advice may be summarized in these words:—Keep the foul lime closely covered and sheltered from wind, empty the purifiers quickly, spill nothing in so doing, and avoid making dust, and get the stuff removed out of the works as soon as possible. And if there is no particular novelty in these recommendations, they are at least such as can readily be subscribed to by all parties concerned in the duties to which they apply.

Respecting the offensive smell sometimes noticeable from oxide of iron undergoing revivification, Dr. Ballard notes that it is due to the evolution of ammonia; any occurrence, therefore, of this kind should direct instant attention to the scrubber. But as at times the best scrubbing arrangements may be accidentally defective, he recommends that the revivifying floor should be elevated above the roofs of any neighbouring houses. As to possible nuisance from tar and ammoniacal liquor, this may be prevented by keeping all receptacles for these matters closely covered from the air, any necessary openings in them for escape of air being always covered with a box containing trays of oxide of iron. These remarks close that portion of the report which relates to gas-making.

The next portion of the report deals with the manufacture of sulphate of ammonia, with which gas managers are closely concerned, and which has in some quarters attained unenviable notoriety as a particularly offensive business; but this, with some other processes connected with the treatment of some of the residual products of the manufacture of gas, will be considered in our next notice of Dr. Ballard's work.

Gas and Water Statistics.*—Two publications have recently been issued which are intended to form together a complete catalogue of all gas and water undertakings carrying on operations, or having offices in the United Kingdom. "The Gas and Water Companies Directory" is now in its fourth year of publication, and has consequently attained considerable fulness and accuracy, most of the principal gas and water companies being represented, with the names of their chief officials; the *personnel*, moreover, being included in a separate index, which is a convenient arrangement. For traders especially this work should be useful. "Gas-Works Statistics" is a new venture, intended to supplement the older publication by giving an idea of the extent of the operations of every gas undertaking in the United Kingdom, including the weight of coal carbonized and gas produced annually, with the illuminating power, selling price, rate of payment for public lamps, and rate of dividend for the past twelve months. As might be supposed in a first issue, there are a considerable number of imperfect returns, which may be expected to be diminished in future editions. But still the pamphlet contains much that should be interesting, and, when complete, it is evident that a reliable body of statistics of this nature, in a handy form, would be valuable for purposes of comparison. The success of such a compilation will, of course, depend essentially on the completeness and accuracy to which it can be brought, and for this the willing co-operation of interested persons is of prime necessity.

Communicated Article.

EFFECT OF TEMPERATURE IN THE GAS AND AIR SUPPLY UPON THE ILLUMINATING POWER OF GAS-FLAMES.

By Mr. R. H. Patterson, F.S.S.

Second Part.

The only reasonable motive that there can be for *heating the gas* when supplied to a burner is, that this preliminary heating may enable the gas-flame to acquire a higher temperature, or intensity of combustion, and consequently burn with greater brilliancy. There can be no doubt that an advantage is obtainable from heating ordinary fuel in grates or furnaces. But there is a very great difference between that case and the use of gas for illuminating purposes; because ordinary fuel, such as coal, presents considerable resistance to ignition. A lucifer match, for example, or even a dozen of them, may wholly fail to ignite it; heat or flame in considerable strength or mass is required before ignition is produced. Or, which comes to the same thing dynamically, a small flame must be applied to coal for some length of time before combustion is produced. Here, then, is something to be saved or economized. Either a small amount of heat, or a shorter application of it, will suffice to ignite fuel which has been heated. Also, in a grate or furnace there is always some part of the fuel not actually ignited; and so long as this is the case it is obvious that the higher the temperature of the unignited portion, the less heat will be absorbed from the burning portion to produce combustion in the rest.

Still more clearly is it of advantage to heat fuel which is *about to be added* to a fire or burning furnace; for the first effect of the introduction of cold fuel is necessarily to reduce the temperature of combustion—indeed, *any* addition of fuel which is not actually burning must operate in this disadvantageous manner. And herein lies the greatest defect in the present system of gas-making. Every four or six hours the retort is emptied of its mass of highly heated coal; its glowing sides become cooled by the inrush of air, and still more by the charge of fresh coal; so that no sooner is the maximum temperature attained than it is suddenly pulled down to too low a point to allow of the distillation being effectively carried on. One way of remedying this (although there are serious practical difficulties in applying it) would be to feed the retort steadily in driblets by means of small-sized coal in a hopper; and the other is to heat the coal which is about to be supplied to the retort. But to heat coal to any considerable extent means also to vaporize a portion of its combustible and illuminating substance; and unless the valuable vapours thus discharged from the coal by heat are preserved and utilized, more damage may be done to gas-making than is compensated by the intenser combustion produced by this heating process in the retort.

But the obvious advantages obtainable from heating fuel prior to ignition and combustion, are not paralleled when the same process is applied to gas. The more sluggish any combustible matter is—in other words, the more slowly combustion extends from part to part—the more valuable is the effect of prior heating; but when the whole mass springs into a blaze the moment the requisite temperature is applied to any part of it, it is hard to see what advantage

* "Gas-Works Statistics, 1880;" and "The Gas and Water Companies Directory, 1880." London: C. W. Hastings.

prior heating can confer. No one thinks of heating gunpowder in order to intensify its combustion; and coal gas, when employed in jets for illuminating purposes, burns for all practical purposes with not less instantaneousness and spontaneity. It is true that in some of the thicker gas-flames there is a tiny core of gas *not burning;* but this is not owing (as in coal) to what we may call sluggishness of combustion, or resistance to ignition, but merely because that part of the gas is for the moment excluded from the air. When spread out and in contact with air, coal gas, owing to the exceeding minuteness of its combustible atoms, burns all through instantaneously; and, as is well known, even when gas is in bulk an intermixture of air suffices to render it explosive. The mere touch or impact of a lighted lucifer match—even the smallest spark of fire—sets any gas-jet, or the whole hundred jets of the Wigham burner, instantaneously into full combustion, and at as high a temperature as the gas-flame can develop. Thus, in a moment of time, the gas is raised from the ordinary temperature of 60° or 70° Fahr. to about 5000° Fahr. What difference, therefore, can it make whether the unignited gas has a temperature of 60° or 600° Fahr.?

And such a temperature—viz., of 600° Fahr.—will be found, by any one who makes the experiment, an exceedingly troublesome one to produce in gas. Moreover, as is well known, if coal gas be raised to this temperature—at least, by any means hitherto employed—there will be found some deposit of carbon upon the surface of the heating material. Gas cannot possibly be raised to even an ordinarily high temperature unless the tubes or chambers in which it is contained are filled by a mass or network of conducting material—such, for instance, as wire gauze—which conveys the heat from the outer surface of the pipe or chamber inwards to all parts of the gas-stream; and, whatever the material thus employed for conducting the heat, and effectually applying it to the gas, it will be found coated with carbon when the temperature of the gas rises to 600° Fahr., or even less. The gas, in short, begins to suffer from "dissociation," some of the richer hydrocarbon compounds being broken up, with a deposit of carbon, which is the illuminating substance.

Upon these various grounds, it seems to me that the result which I obtained from the experiments in 1871—viz., that the heating of the gas added nothing to the illuminating power of the gas-flame—is in accordance with general reasoning. And this is my opinion on the question as it at present stands; but no one will be more ready to change it than myself when, or if, further experiments should point to an opposite conclusion. Also these experiments show the necessity for the heat being applied close to the burner, otherwise the gas will return to its ordinary temperature before it reaches the point of ignition.

Temperature of the Burner.

But there is another phase of the question to be considered; and it is entirely distinct from that of heating the gas, although practically it becomes mixed up with it. Although there may be no advantage to be gained by heating the gas, it is manifestly of importance that there should be no withdrawal of heat from the gas-flame. And such an abstraction of heat always does take place, more or less. I have already spoken of the air supply, the heating of which undoubtedly lessens the withdrawal of heat from the flame, or enables the flame to attain a higher state of combustion; and I need not speak further of the cooling effect of the atmospheric surroundings of the flame. But there is another source of heat-absorption—viz., the burner itself. That every gas-burner absorbs heat from the flame is demonstrated to the touch. The burner quickly becomes so hot that it cannot be handled. This is especially the case with the Argand, in which the mass of the burner, and notably the surface in direct contact with the base of the flame, is much larger than in jet burners, both bat's-wings and fishtails. When Mr. Sugg was constructing his new Argands, with the small separate supply-tubes fitted into the bottom of the burner, he found that if the burner was made of metal (brass or iron) it became so hot even at its lowest part that the "soft metal" employed in soldering-on the small tubes was melted; and one, if not the immediate cause of his making the body or cylinder of his Argand of steatite was to obviate this difficulty—the steatite being a comparatively non-conducting substance. Even the steatite Argands become so hot that it is not safe to handle them while the gas is burning; and metal Argands become so hot that Mr. Sugg states their temperature at from 500° to 600° Fahr.

This heat, of course, is entirely obtained from the gas-flame. But this absorption of heat by the burner is somewhat different in character from the other form in which a withdrawal of heat from the flame takes place—viz., by ordinary radiation into the surrounding atmosphere. Air is a bad conductor of heat, whereas metal, like brass or iron, is one of the very best conductors; accordingly, relatively to the extent of radiating surface of the flame exposed to these rival absorbents of heat, more heat will be withdrawn by the metal than by the air. On the other hand, the heat absorbed by the air is more completely or suddenly lost than the portion absorbed by the metal burner; because the former is dissipated at once, carried off instantly into the general atmosphere, whereas the burner retains a portion of the heat which it absorbs. Nevertheless, the burner is constantly parting with its heat to the air; and this radiation prevents the heat accumulating in the burner beyond a certain point; but this accumulated temperature—say 500° Fahr.—is only maintained by the constant absorption of heat from the flame commensurate with the heat which the burner is constantly giving off into the air.

Now, were it possible to keep a burner hot, irrespective of the flame, the hotness of the burner would be of some advantage; and if the burner could in this manner (*i.e.*, by independent means) be kept so hot as altogether to stop its absorbing heat from the flame (in which case the burner would require to be as hot as the flame itself), there would be a considerable advantage. But the case is different when the hotness of the burner is produced by an abstraction of heat from the flame itself. Obviously, it would be better if the heat remained in the flame, instead of passing into the burner. Further, what happens is not merely a transference of heat, but also a loss of it. Were it possible for the burner to retain all the heat which it absorbs from the flame, this abstraction would be of merely momentary disadvantage; for the burner would quickly acquire its highest possible temperature, after which the abstraction of heat from the flame would cease. But, as needs hardly be said, this is not the case; for, although the burner becomes hot, it is constantly losing a part of its heat by radiation, and this lost heat is being constantly made up by an equal absorption of heat from the flame.

Thus the advantage which Leslie and others thought was obtained by the burner becoming hot is an illusion. Undoubtedly, *per se*, the hotter the burner the better, but not when the heat is obtained from the gas-flame itself, and under circumstances where the burner is parting with its heat almost as quickly as it is abstracting it from the flame.

These considerations help—perhaps suffice—to explain what, *primâ facie*, is a mystery. It has been found that steatite Argands give a higher light than metal Argands identical in structure. This was certainly a very puzzling phenomenon. Mr. Sugg made the reasonable conjecture that this was owing to the coolness of the gas as it issued from the burner. The steatite being comparatively a non-conductor of heat, the gas in the cylinder of a steatite Argand must unquestionably be cool, at least compared with what it is in a metal Argand. And, in fact, this was, at first sight, the only apparent difference; and therefore it was a natural inference that it was the coolness of the gas which gave to it its higher illuminating power when consumed in a steatite burner.

Effect of Non-Conducting Burners on Illuminating Power.

It is important to observe at the outset how this matter stands. There is no question that the cooler the gas the smaller is its volume, and therefore the heavier it is, containing a larger amount of illuminating substance. But this consideration must be here excluded, because in the experiments in question the gas has the same temperature as it passes *through the meter* whether to the metal burner or to the steatite one; and as the same weight, or quantity of illuminating substance, passes through the meter within any given time (per hour or minute), the same quantity of illuminating substance must simultaneously issue from the burner. Accordingly, the only difference between the two cases is, that in the steatite burner, wherein the gas is less heated and less expanded, the gas will be not only cooler, but will issue with less velocity than from the metal burner. Now, under the circumstances of this case, it cannot possibly be thought that the fact of the gas being hotter would be detrimental to the illuminating power of the gas when it is ignited; so that—if these were all the facts—the lesser light from the metal burner would plainly be owing to the fact that the gas issues from the burner with a higher velocity. And, if this were all, a very slight enlargement of the holes of the metal burner (so as to allow of the gas issuing at the same velocity as from the steatite burner) would suffice to make the metal burner quite as good as the steatite one.

But the considerations previously stated suggest quite a different explanation—namely, that the better light given by the steatite burner has nothing to do with the temperature of the gas, but directly with the different conducting properties of the two burners. The steatite, being "non-conducting," *abstracts less heat from the flame than the metal does*, thereby allowing the flame to rise to a somewhat higher temperature of combustion. The difference, in short, is not that the steatite burner keeps the gas cool, but that it *keeps itself cool*. The cause, therefore, does not lie in the *consequences* of the burner being hot or cool, but in the fact that the burner *is* hot or cool. It is not the temperature of the gas that makes this difference, but the temperature of the burner—the hotness of which is but another word for the abstraction of heat from the flame.

Doubtless it will seem to many, perhaps to most persons, that I am giving an exaggerated importance to this matter; and at one time I should have shared their opinion. But that the loss of heat in a gas-flame through absorption by the burner must be very considerable may be illustrated by reference to some well-known facts. For example, look at the safety-lamp of Sir Humphry Davy. The combustible "fire-damp" of the coal-mine, entering through the wire-gauze which encloses the lamp, will take fire within; but the flame cannot extend beyond the interior of the lamp, owing to the great reduction of its temperature in passing through the wire-gauze. The metal absorbs so much of its heat that the flame is extinguished—the combustible vapour is cooled down below its temperature of ignition or combustion. Or, as a still closer parallel, take the facts upon which the safety-lamp was devised, and which are usually exhibited by chemical lecturers. Take a piece of wire-gauze containing about 700 meshes to the square inch, hold it close above a gas-jet, and ignite the gas above the gauze; the gauze may then be raised several inches above the jet, and the gas will continue to burn; yet the gas below will not take fire—the gas burning only on the upper side of the wire-gauze. Here it is shown plainly that the metal abstracts so much heat from the burning gas that the flame cannot extend downwards, because in so doing the gas becomes cooled below its temperature of combustion. The abstraction of heat by the metal must, therefore, be very considerable. Now, the top of a metal burner must act in much the same way—withdrawing heat from the flame above it; while the body of the burner being likewise of metal, the heat absorbed by the top (the portion in actual contact with the flame) is being perpetually carried off, and is re-

placed by a fresh and continuous absorption of heat from the flame. In short, a metal burner may be regarded as *an ingenious contrivance for reducing the temperature of the flame*—the metal acting as a special absorbent of the heat, which thereafter it discharges uselessly into the air.

I may here remark, in passing, that probably the French Bengel burner, which greatly surpassed any other prior to Sugg's standard Argand (beating the Sugg-Letheby in the proportion of 112 to 100), owes a considerable part of its merits to the material of which it is made—the cylinder or body of the Argand being made of porcelain, and very broad or thick. Indeed, looking at the mere structure of the Bengel, apart from its material, it is hard to see why it gives the unusually high illuminating power from the gas. Like the steatite Argand, the comparatively non-conducting material of the Bengel will withdraw less heat from the gas-flame; and, as Herr F. Siemens remarks, even a comparatively small increase of the temperature of a flame must give an appreciable increase in the light which it emits.

Accordingly, as it seems to me, the fact that a steatite Argand gives a better light than a metal one does not prove there is no advantage in heating the gas; but merely that there is no advantage in this when the prior heating is made by, and at the expense of the gas-flame, and in such manner that the heat imparted to the gas is only a small part of the heat abstracted by the burner from the flame—the larger part being lost by radiation from the entire surface (both inner and outer) of the Argand.

Heating the Burner.

But the case would stand very differently if the gas were *heated independently of the gas-flame*. As a question between hot gas and cold, it will hardly be doubted that the former is more favourable to its combustion. Although, as already said, it seems to me that no temperature can, as a practical matter, be imparted to the gas sufficient to make appreciable differences in its illuminating power when ignited—the mere ignition raising the gas instantly to a temperature of 5000° Fahr.—still, whatever extra heat be imparted to the gas before ignition must, *per se*, tend towards favouring combustion.

But there is one way in which a prior heating of the gas may make itself perceptible as an improvement—viz., by *heating the burner*, and thereby lessening the burner's abstraction of heat from the flame. Indeed, if the explanation above given of the superior light from a steatite burner compared with a metal one be correct—viz., that the former abstracts less heat from the flame—then it follows, beyond question, that anything which lessens the burner's abstraction of heat from the flame will be advantageous. And if you *heat the gas* (by independent means, and not from the gas-flame itself), you will *also heat the burner*; and thereby, its temperature being raised, the burner will absorb less heat from the gas-flame.

Conclusions as to Heating the Gas.

The conclusion of the whole matter, then, seems to be—(1) That any prior heating of the gas must be (*per se*) favourable to its combustion; but that, owing to the remarkable combustibility of coal gas, which, when ignited instantaneously, possesses a temperature of about 5000° Fahr., a mere heating of the gas to 500° Fahr. (which is very difficult) is not enough to make the slightest perceptible difference in the intensity of combustion and luminosity of the flame. (2) That, besides the difficulty of heating so tenuous a vapour as coal gas, it is impossible practically to raise its temperature above 500° or 600° Fahr. without producing a deposit of carbon, and loss of illuminating power. (3) That there is not only no advantage (as Leslie and others thought), but a positive disadvantage, when the gas is heated by, and at the expense of the gas-flame; in other words, by means of the heat conveyed to it from the flame through the burner, a still larger portion of this heat being simultaneously lost by radiation into the air. (4) That the heating of the gas is, and can be, only advantageous when it is made independently of the gas-*flame*—from some other source than from the ignited gas itself; but, as with furnaces, this other source may be supplied from the heated *products* of combustion. (5) That the gas so rapidly loses any heat which may be imparted to it, that the heating, while made from some other source than the gas-flame, must be applied close to the point of ignition—to the burner itself, or the tubes immediately supplying it. And, lastly, as seems to me (and bearing in mind No. 1), the only appreciable advantage from heating the gas will be that the hot gas will *heat the burner*, and thereby lessen the burner's abstraction of heat from the flame.

(*To be concluded next week.*)

We notice that Mr. Frederick Colyer, M. Inst. C. E., having retired from the firm of Messrs. G. Waller and Co., gas and water engineers, with whom he was so long connected, announces that his consulting practice in all matters connected with gas and water works will be continued at 18, Great George Street, Westminster.

We understand that the Rustless and General Iron Company (Messrs. James E. and Samuel Spencer) have heard from their agent at the Sydney Exhibition that a gold medal has been awarded to them for "anti-corrodo tubes and fittings," treated by Professor Barff's rustless process. They have already supplied goods to fifty or sixty of the leading gas and water companies, and have had numerous repeat orders.

The Dowson Economic Gas Company, Limited.—Among the new companies recently registered is one with the above title. The Company proposes, upon terms of an agreement of the 6th ult., to purchase and work the patent granted to Mr. J. E. Dowson for "Improvements in Apparatus for the Manufacture of Gas." It was registered on the 21st ult., with a capital of £8000 in £50 shares. The purchase consideration is £6000 in fully paid shares.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

PUMPING GAS AT BECKTON.

Sir,—The letter of Messrs. Gwynne and Co. in your last week's issue is one to which I am bound to reply, as the object of their communication is to discredit my statement, and to make it appear that we are indebted to them for the laying out of our pumping machinery; inasmuch as the arrangement carried out corresponds exactly with the drawing which accompanied their tender. By such arrangement, I presume, they mean the coupling of two exhausters on to one engine, with the slides of the former at right angles to each other. But they are not ingenuous enough to tell you that it could not very well be otherwise, inasmuch as the specification (the original of which I send you) on which both Messrs. Donkin and Co. and Messrs. Gwynne and Co. tendered was the same, and the date of the specification—Jan. 28, 1879—prior to the date of the letters they refer to. On reference to this specification, you will find the following:—

"*Each engine to be coupled direct to a pair of exhausters, and the couplings to be formed so as to admit of being readily disconnected so as to drive a single exhauster. In coupling together each pair of exhausters care must be taken that the flaps of each exhauster are at right angles one to the other, so that little or no oscillation is produced in working.*"

As your readers will see, any two or more firms tendering for machinery on these and other conditions, their accompanying plan, with the exception of details, must be the same. So they were; and the tender of Messrs. Donkin and Co., being the lowest, was accepted. And let me here remark that I do not pretend, nor am I fool enough to claim the slightest novelty for the arrangement specified, as it is just what any engineer would stipulate for, considering the circumstances of the case.

Now, if I understand Messrs. Gwynne and Co.'s contention, it is that the arrangement which I have quoted, and which we have in use, is the patent arrangement which they specified in December, 1871. Allow me to say, in reply, that if this is the novelty in the patent, it would appear that Messrs. Gwynne and Co., like a good many other patentees, by taking out and maintaining such a patent, have simply added to Her Majesty's Exchequer; for supposing it to be granted, for the sake of argument, that such a patent (assuming the thing not to have been done before) would be valid, what is to be said of it in the face of the publication of the information in January, 1857, in Mr. John Beale's patent, No. 2090, page 4, line 31, as follows:—

"*When a more equable action is required than can be obtained from one engine, two of these engines, having their sliding pistons working at right angles to one another, may be employed as indicated at Fig.* 1; *the sliding position of the second engine being shown by dotted lines.*"

Although it is here spoken of as an engine, it refers to the original form of Beale's exhauster; and, in giving this quotation, I must do Mr. Beale the justice to state that it formed no part of his claim, and it does not appear that he considered it a novelty.

I have been informed that another type of exhauster has been working in the same manner at our Bow Common works many years before the date of the so-called patent.

G. C. Trewby.

The Gaslight and Coke Company,
Beckton, North Woolwich, May 17, 1880.

THE RECENT LANTERN TRIALS AT BIRMINGHAM.

Sir,—On reading over your report of the recent meeting of the Midland Association of Gas Managers, it has occurred to me that some observations of mine, although quite correctly reported, are likely to give rise to a little misapprehension. When speaking of the possibly shadowless effect of the clear glass circular lantern, I had in my mind chiefly the triple arrangement with which I had been experimenting, and the effect of which is all that can be desired. When, however, the lanterns are used singly, and at a moderate distance apart, undoubtedly a greater difficulty is experienced in obtaining a shadowless effect—corresponding, in fact, to the amount of obstruction placed at the bottom portion of the lantern, and rendering the employment of some sort of reflector almost unavoidable. I am not, however, without hope that this may be reduced to a very small matter indeed.

Birmingham, May 15, 1880. Charles Hunt.

THE BRAY LANTERN AND BURNER, AND MR. SUGG.

Sir,—I have read Mr. Bray's long letter appearing in your issue of last Tuesday, and have carefully examined the various drawings referred to therein; but as this matter is now assuming a shape which cannot be of interest to your readers—viz., a personal dispute between two manufacturers—I do not propose to trouble you with any observations in detail, nor to write any further letter to you in continuation of the recent correspondence, whether Mr. Bray answers me or not.

At the same time, before finally leaving the subject, I would point out to you that, however ingenious and complete Mr. Bray's answers may be so far as he has gone, he has avoided one, the main point, altogether; for if you read his letters, you will see that he does not dispute my position—that in all points in which our lanterns are similar, either I or some other person has anticipated him.

I enclose with this a declaration of Mr. John Goodson, who made the model for the first hollow-top burner. On searching through my books, I find that the date of the production of this model is proved to be 1868 and not 1872.

Vincent Works, Westminster, S.W., May 15, 1880. William Sugg.

[Enclosure.] *May* 10, 1880.

I, John Goodson, of 3, Ashgrove Villas, Mortlake, declare that, on or about the month of January, 1868, I being then in the employ of Mr. William Sugg, of Vincent Works, Vincent Street, Westminster, did, under his direction, make a model for a hollow-top steatite burner for reproduction in steatite. [Shape of model given.] I have still by me the tool I made to hollow out the head of the burner.

(Signed) John Goodson.

Witness to signature,
C. F. Just, 93, Disraeli Road, Putney, S.W.

MR. PATTERSON ON THE EFFECTS OF HEAT IN RAREFYING GAS IN BURNERS.

SIR,—Without endorsing all else that Mr. Patterson says in his interesting article in your last issue, my unsophisticated mind refuses assent to the proposition contained in the second paragraph on the "Effects of Heat in Rarefying the Gas," viz.:—"This expansion of the gas would tend to impel the gas at a quicker rate through the orifices of the burner. The pressure behind remaining the same, while the gas within the burner increased in bulk, the tendency would be for the gas to be driven through the orifices more rapidly than before."

Now, it appears to me that if the pressure in the burner is greater than the pressure of the gas entering the burner, no more cold gas can enter till the pressure in the burner is reduced to the normal point, and that the exit pressure can in no case exceed the inlet pressure.

Perhaps Mr. Patterson or some other gentleman of "light and leading" will enlighten one who is

WILLING TO LEARN.

Manchester, May 12, 1880.

CONVEYING GAS ACROSS SMALL NAVIGABLE RIVERS.

SIR,—In reply to your correspondent, "D. W.," I may state that the Hampton Court Gas Company's Engineer (Mr. E. Price) consulted me, about two years ago, in reference to a main he wished to cross the Thames at Moulsey; and, seeing no difficulty in the matter, a contract was entered into between the Company and Messrs. James Oakes and Co. to lay them a 14-inch main in the bed of the river, averaging 11 feet deep, by dredging and a diver. This main was completed, and has been at work for more than eighteen months.

Having carried out this work, I can give "D. W." any information he wishes if he will write me.

In reply to his questions:—

1. Condensation is so little that it need not be considered. Mr. Price would give the actual amount of condensation.

2. The river being impregnated with salt water, a cast-iron main should be laid, not a wrought-iron one.

3. The hose across the bridge is objectionable and costly, requiring constant attention.

4. I should recommend a 6-inch pipe, not a 4-inch one.

21, *Wharf Road, City Road, N., May* 14, 1880. CHARLES HORSLEY.

SIR,—Last autumn, having to cross a rapid tidal river about 150 feet wide with a new 5-inch main-pipe, where there was no permanent bridge, and then, immediately after, carry my main 100 feet under a tidal canal, I adopted the following plan, which would meet the inquiry of "D. W." in the last issue, as far as the immersion of the pipe under water is concerned:—Having a depth of 11 feet of water to contend with, I increased the pipe to 6 inches diameter, and had my pipes cast with flanges strongly supported with fillets; and faced each flange, as well as the connections of the syphon. I then, with great care and exactness, bolted all together with thin canvas washers well coated with red lead; and had same lowered into its place, using every precaution so as to prevent any undue strain on the flanged joints. An expansion-joint was attached above ground, so as to regulate the strain consequent on expansion and contraction of the pipes, and I would recommend "D. W." to adopt the same.

Although my pipes have been laid since December last, up to this date I have not been obliged to pump my syphon; indeed, there has not gathered 1-10th of an inch of water, and I am supplying gas daily.

I would not advise the use of a hose, because the expenses attendant on changes, and consequent loss, &c., would be great. I had intended to put a similar appliance in my case, but abandoned it; and no loss or trouble has been experienced since my pipes were laid as they have been.

ANDREW GIBB.

Gas-Works, Galway, May 15, 1880.

LEAKY GASHOLDER-TANKS.

SIR,—If "W. S. M'G." will try a quantity of horse litter, I think he will get his tank practically sound. The dung should not be too compact, for in that case it will all settle to the bottom of the tank; but should be of such a consistency that it will float about when agitated; it will then wash into the crevices. The extent of fracture, &c., must decide the quantity and compactness of the litter.

H. T.

May 13, 1880.

NORWOOD (MIDDLESEX) WATER-WORKS.—The first stone of these works was laid on Tuesday last, at the pumping-station, which is situated close to the Southall station on the Great Western Railway. The business is in the hands of a limited liability company, the Chairman of which, Sir George Innes, performed the inaugural ceremony in the presence of numerous spectators. The intention of the promoters of the undertaking is to exercise an exclusive right conferred upon them for supplying the populous and increasing districts of Southall, Southall Green, North Hyde, Frogmore Green, and Norwood with water, and also, if possible, to extend the mains of the Company through the towns and districts of East Bedfont, Cranford, Feltham, and Hanworth. The Company are now sinking a shaft through the chalk formation, from which their supply of water will be obtained, and they hope to get a pressure that will enable them to give an adequate supply at the highest level in the district, which is now chiefly dependent on shallow surface wells and streams for its water.

FYLDE WATER-WORKS COMPANY.—The report of the Directors presented at the half-yearly meeting of the above Company, recently held, stated that the expenditure on capital account had been increased during the six months ending Feb. 29, 1880, to £177,813 19s. 11d. The amount of water-rates for all purposes, and of profits on fittings during the half year, was £7039 2s. 4d.; less interest on loans and commission, £783 5s. 11d.; working expenses, including rents, rates, and taxes, £1735 13s. 5d.; and allowances for empty houses and bad debts, £282 12s. 5d.; leaving a balance of £4237 10s. 7d. The number of consumers had increased by 92, and amounted to 7187. The Directors recommended a dividend on the subscribed stock of the Company at the rate of 4½ per cent. per annum, free of income-tax, and that the balance remaining, after making such payments—about £900—be carried to the reserve-fund. The restoration of the Grizedale reservoir was being vigorously proceeded with, and the staff had been increased by the appointment of Mr. T. Duncanson as General Manager. The report was adopted, and the dividend therein recommended declared.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, MAY 13.

(*Before Vice-Chancellor* MALINS.)

BUENOS AYRES GAS COMPANY, LIMITED, AND BOWER *v.* WILDE.

Mr. HIGGINS, Q.C. (with him Mr. BRADFORD), moved on behalf of the plaintiffs to commit the defendant for contempt of Court, in having published an advertisement warning holders of debentures that they could not resort to the assets of the Buenos Ayres Gas Company represented by the defendant, in breach of an undertaking given by him to discontinue the issue of advertisements calculated to injure or disparage the credit of the plaintiff Company; or, in the alternative, for an injunction restraining the issue of such advertisements, and for the costs of the motion. On the 15th of April the plaintiffs applied for an injunction to restrain the defendant issuing advertisements headed "Caution," and an undertaking was then given not to issue any further advertisements; but the defendant had adopted means, notwithstanding such undertaking, of repeating the injury.

The VICE-CHANCELLOR asked what the terms of the undertaking were.

Mr. HIGGINS said the undertaking was not to insert any of the advertisements until the motion was disposed of, but immediately after an advertisement appeared in a London newspaper stating that the defendant had been restrained from issuing the advertisement headed "Caution," and setting out the objectionable advertisement. If the former advertisement was objectionable, the latter one was clearly so, because it was a repetition of the old offence.

Affidavits in support of the plaintiffs case having been read to the Court, proving the publication of the new advertisement,

The VICE-CHANCELLOR said he did not see why the defendant wanted to issue any advertisement. It was not usual for a person to advertise a defeat.

Mr. HIGGINS said it was admitted that the advertisement had been inserted by the defendant. The rule of the Court was perfectly clear that proceedings upon interlocutory applications must not be made use of for the purpose of injuring either party. That had been decided by the cases of *Coleman v. West Hartlepool Railway Company* (8 Weekly Reporter, 734) *The Cheltenham and Swansea Railway Company* (8 Equity, 580), and *Bowden v. Russell* (Weekly Notes for 1877, page 55).

The VICE-CHANCELLOR said the question was whether this was virtually a repetition of the former advertisement.

Mr. HIGGINS said it was a breach of the injunction, for which the defendant was liable to be committed to prison. Even if there had been no undertaking, it would be a contempt of Court, and would come within the rule of the authorities to which he had referred, because it was not a fair representation of what took place in Court. If his lordship thought it was not a contempt of Court, he should ask for an injunction to prevent the insertion of any advertisement which was calculated to disparage the credit of the plaintiff Company.

Mr. GLASSE, Q.C. (with him Mr. RUSSELL ROBERTS), who appeared for the defendant, said it was hardly possible to conceive a more impudent motion. The advertisement had been sent to the paper in question, and the Editor had, upon his own responsibility, put it in large type, and without any authority from the defendant. The defendant in his affidavit stated that he had no intention to commit any contempt of Court in any shape or form. The original writ was issued on Dec. 5; on the following day the defendant withdrew the advertisements, and it was not until the 8th of March that the notice of motion was given. The report being true in every particular, the authorities which had been referred to had no application.

Mr. HIGGINS having replied upon the whole case,

The VICE-CHANCELLOR, in giving judgment, said this was a motion to commit the defendant for breach of an undertaking given by his counsel on April 15, and the whole litigation between the parties arose from the fact that the plaintiff Company were about to raise money upon debentures. The defendant, who represented the Buenos Ayres Gas Company, seemed to have been needlessly anxious to caution the public that the money being raised by the Limited Company was not to be a burden upon the unlimited Company, and thereupon he inserted the "Caution" in several newspapers. Upon a motion being made to restrain these advertisements, an undertaking was given not to repeat the "Caution." An inaccurate report of what took place having appeared in a daily paper, the defendant sent an account of what had taken place to the paper which had been referred to, and from what had been said he was quite unable to make out that there was anything inaccurate in the account so sent. As he understood the law, a report of proceedings in a court of justice might be published, provided it was an accurate report. Although he thought it would have been as well for the defendant to have abstained from issuing further advertisements; still, he thought the motion for committal could not be sustained, and therefore it would be refused, but without costs. In dismissing the motion, he did so with the intimation that it would be better not to insert any further advertisements.

QUEEN'S BENCH DIVISION.—FRIDAY, MAY 7.

(*Before Justice* LUSH.)

STANSFIELD *v.* THE YEADON AND GUISELEY GAS COMPANY.

This was an action tried before Justice Lush at the Yorkshire Winter Assizes, at Leeds, in February [see *ante*, p. 204], when a verdict was given for the plaintiff. On that occasion some points of law were reserved, and they now came on for further consideration.

Mr. WILLS, Q.C., and Mr. LOCKWOOD appeared for the plaintiff; Mr. CAVE, Q.C., and Mr. FORBES were for the Gas Company.

Mr. WILLS said the action was brought by Colonel Stansfield, of Esholt Hall, against the Yeadon and Guiseley Gas Company, to recover damages for a nuisance caused to his premises by the fouling by the Company of the water of a stream of which he was riparian owner, and also to recover a penalty under the Public Health Act, 1875. The 68th section of this Act provided that "any person engaged in the manufacture of gas who causes or suffers to be brought, or to flow into any stream . . . . any washing or other substance produced in making or supplying gas, or wilfully does any act connected with the making or supplying of gas whereby the water in any such stream is fouled, shall forfeit for every such offence the sum of £200, and after the expiration of 24 hours notice from the local authority, or the person to whom the water belongs, in that behalf, a further sum of £20 for every day during which the offence is continued, or during the continuance of the act whereby the water is fouled. Every such penalty may be recovered, ... in the case of water belonging to or under the control of the local authority, by the local authority, and in any other case by the person into whose water such washing or other substance is conveyed or flows, or whose water is fouled by any such act as aforesaid." The facts were these: The plaintiff's property was some distance from the gas-works, and land belonging to other people intervened; but where the stream passed through his park the land was his on both sides. What doubt there could be that he was the person whose water was fouled by the act of the Gas Company he (Mr.

Wills) could not understand. The jury at the trial found that the plaintiff's water was fouled, that a nuisance was caused there, and that the water was contaminated, and they gave a verdict for £100 damages. It was then contended by the Gas Company that the words "person into whose water such washing or other substance is conveyed or flows" must mean the person along the stream into whose water the contamination first flowed. He had good hope of convincing his lordship that the words could not receive that limited construction, for if it were so, all that the Gas Company would have to do would be to buy the land on both sides of the stream where their pipes issued, and then no one could bring an action against them for causing a nuisance. It was immaterial, however, to discuss this, because there were the larger words, "or whose water is fouled by any such act as aforesaid;" and there could be no doubt that the plaintiff's water was fouled. He did not see what more there was to be said about it.

Justice LUSH said the other question was whether the amount to be recovered was cumulative—whether the person injured could recover both damages and the penalty.

Mr. WILLS said this suggestion was made, but he did not know on what authority such a restriction could rest.

Mr. CAVE said he did not think he could maintain this. It was clear upon the statute that both damages and the penalty could be recovered.

Justice LUSH said he thought so too.

Mr. WILLS said inasmuch as he really did not quite know what he had to meet, he would reserve anything further till he had heard his friend.

Mr. CAVE said his contention was that, as this was a penalty, the Act must be construed strictly, and if it was construed in the sense in which it was sought to be construed by the plaintiff, every riparian proprietor down the stream might bring an action to recover a penalty of £200. There was no limitation. It did not say whoever sued first, but "every such penalty may be recovered by the person into whose water such washing or other substance is conveyed." In this case who was the person into whose water such washing was conveyed? It was conveyed into a stream. Who was the person? Surely not some particular riparian proprietor some distance down the stream from the works. If the "person" meant anybody at all in connection with the stream, it must mean the whole of the riparian proprietors as a body.

Justice LUSH: Whose intervening land is it?

Mr. CAVE said the Gas Company were the owners of the land on one side at the point where the pipe entered the stream, and the Vicar was the owner on the other side. A Mr. Barwick was then the owner, and next came Colonel Stansfield about 200 yards down.

Justice LUSH said it must be admitted that at common law every riparian owner all the way down, whose water was fouled, would have cause of action.

Mr. CAVE said that was so; but then this was, of course, as an injury to his riparian rights, and was one reason why there was no necessity to extend the penalty for the purpose of compensating him. Colonel Stansfield had, in fact, recovered £100 in this case; but he also sought to recover a penalty, and in order to do that he must show that he was clearly the person pointed out by the Act. The words of the Act were, "the person into whose water," not "any person into whose water." In the case of a stream of this kind, there was no person who answered to the description at all. If the stream had been purchased by any individual for the purpose of water-works or otherwise, then it might be said that the stream belonged to him, and it would be his in a sense extremely different from that in which it could be said to belong to a riparian proprietor. The water did not belong to Colonel Stansfield at the moment it was fouled, and it did not belong to him after it had passed his premises. He was not able to deal with the water even while it was passing through his property, except in a certain limited way. He might take it by the mouths of his cattle, or for ordinary domestic purposes; but he could not take it, for instance, to supply another parish with water.

Justice LUSH said it was his water in the sense used here, because it was water which he was at liberty to use for domestic or other purposes.

Mr. CAVE said he should contend it was not so.

Justice LUSH: Do you mean that this section does not apply to any running stream, only to pent-up water?

Mr. CAVE said he thought it must come to that. It was a case for a penalty, and therefore the Court must see that the meaning did come within the Act. It took from him no right; it imposed a penalty upon the Company, and still left the plaintiff able to obtain full compensation for the whole of the wrong that was done him. The question was whether the Legislature had unmistakeably expressed its intention that in addition to compensation a riparian proprietor could obtain a penalty.

Justice LUSH said this argument would be just the same if it was applied to the case of the owner of a reservoir. It was admitted that the penalty might apply; surely he could bring an action also. The penalty was a punishment to the Gas Company in order to repress the practice, quite irrespective of the damage sustained.

Mr. CAVE: Undoubtedly; but the punishment surely must be measured out with some reference to the offence which was committed. This punishment might be inflicted upon them quite irrespective of any wrong-doing upon their parts. Although they might have taken every possible care, yet if the stuff complained of escaped into an adjoining well, then undoubtedly they were responsible.

Justice LUSH: Because they could prevent it with due care.

Mr. CAVE: Looking at the section, it would seem that the Company were liable, although they could not prevent it.

Justice LUSH: If by exercising the greatest care they could stop it, then they must stop it.

Mr. CAVE said, with regard to the riparian proprietors below them, the Company had no control whatever over the number. There might be hundreds, or it might be that the riparian proprietorship rested mainly in the hands of two or three persons. Although the effect produced was substantially the same, yet in the one case there would be 40 or 50 riparian proprietors, each entitled to bring an action for £200, and in the other case only one or two. That would appear to involve an inequality far in excess of what one could suppose the Legislature would seek to impose. He could understand their saying to the Company, "You have let this stuff escape; consequently you must pay a penalty of £200 to the man whose water you have injured;" but to say, "You shall pay £200 to every proprietor all the way down," was to say that the Company should pay a sum which would depend in amount, not in the least degree upon the damage done, but upon whether the property below them happened to be in the hands of one proprietor only, or to have been cut up into a number of small properties.

Mr. WILLS said there was only one penalty for one act of escape.

Mr. CAVE said he found nothing of the kind. The Act said "the person whose water is fouled" may sue. How was Colonel Stansfield "the person"? If it had been "any person," undoubtedly every riparian proprietor, assuming that it might be said to be his water, would fall within the word "any;" but it was "the," and how did Colonel Stansfield make himself "the person," unless it was because he was a riparian proprietor? and if he was entitled to sue because he was a riparian proprietor, and was therefore "the person," he was not more "the person" than any other riparian proprietor.

Mr. WILLS said there was only one penalty, and if one person recovered it no other person could do so.

Justice LUSH: The person who first sues is the person to recover the penalty.

Mr. CAVE said the statute did not say that. If the statute said "the person who first sues," clearly the act of suing would indicate who was the person to whom the penalty became payable. The statute indicated no such thing as that. The person to whom the penalty was to become payable was the person who fulfilled the description—the person whose water was fouled. There was no other mode of ascertaining who he was, and that was not ascertained by bringing an action. If any riparian proprietor was the person whose water was fouled, every riparian proprietor must be in the same condition, and it could not matter that one of them was a little quicker in getting out his writ than another. He (Mr. Cave) was not aware that there was any authority upon the point. It was, of course, a case of the greatest importance to gas companies, because if his learned friend's contention was right, he did not see how he could stop short of saying that every proprietor must be entitled to sue. On these grounds he (Mr. Cave) submitted that the plaintiff did not come within the words "the person whose water is fouled." If they supposed it to be confined to the case of ponds, aqueducts, reservoirs, or streams, which belonged to a man in the sense that he could take the water and do what he liked with it, then "the person whose water is fouled" was a definite person. He was the person to whom the water belonged that was fouled. They had only to look at the aqueduct, reservoir, pond, or well, and ascertain whose property it was, and that was the man whose water was fouled. The same reasoning would apply if the man had full control over a stream; but with an ordinary stream, in which people had only rights as riparian proprietors, he could not see how any one could possibly say who was the person whose water was fouled. The only way in which he could possibly conceive this to be brought about would be by taking the whole together, but this again seemed impracticable, and therefore the word "stream" must be read as being only applicable when it was in the same position as a reservoir, aqueduct, or pond—that was, when it absolutely belonged to some person. If this interpretation were put upon the word "stream," the words of the Act would then be found to be entirely applicable to it.

Justice LUSH: What state of things can you suppose which would give a man a right in a running stream similar to what he would have in a reservoir?

Mr. CAVE: A water-works company might have such a right by Act of Parliament.

Justice LUSH: You cannot suppose that this is confined to cases of that kind, which are very rare indeed?

Mr. CAVE: I do not know why it should not be.

Justice LUSH: Because it would not be giving effect to the general terms of the Act. It expressly distinguishes between a stream which is running water and a reservoir which is standing water.

Mr. CAVE: That assumes, of course, that you are to take the word "stream" in its full extent. I say you may understand it in another sense, in which it is still a stream, but in which the water in the stream is in the same position as the water in a pond or aqueduct.

Justice LUSH: You mean that the riparian proprietor cannot say that the water is his?

Mr. CAVE could not contend that he was the person whose water was fouled, because the water was not his alone. It was his to use to a certain extent, in common with a number of other persons. If there was any one at all who could be said to answer to the language of the Act—"the person"—it must be the person into whose water the pollution first came, and the fact that it went down the stream did not give the separate riparian proprietors the right to sue for this penalty. Another point taken at the trial was that the intent of the Act was to protect water which was in a wholesome state, and capable of being used for domestic purposes—that the penalty was not meant to apply where the water was not previously pure.

Mr. FORBES followed on the same side, and contended that by the Act of Parliament the local authority would not be able to take any action in the matter until they had given notice to every riparian proprietor down the stream, and they had all refused to take proceedings.

Mr. WILLS said his contention was that though there could be only one penalty recovered, but all riparian owners were entitled to sue. There was one offence committed and one penalty. When the Brighton Aquarium was opened on Sundays, there was one offence committed and one penalty imposed, but there were three millions of people entitled to sue. The way in which it worked out was that the person who first obtained judgment exhausted the penalty.

Justice LUSH: It is the case of a penalty which may be sued for by a common informant. The man who first gets *bonâ fide* judgment has the penalty.

Mr. WILLS said there was no practical difficulty in working it out. The person who first obtained judgment exhausted the penalty, and there was an end of it. There was an alternative given. Supposing any one of these persons did not feel disposed to sue, the local authority might take his place, but only on condition that they gave notice to him.

Justice LUSH: Which of them?

Mr. WILLS said whichever they chose. They must distinguish between the offence and the person entitled to sue. The offence was complete when the fouling substance was sent into the stream; the person entitled to sue was ascertained by seeing whose water was fouled. Take the present case. Colonel Stansfield's water had been fouled. Assuming that he did not choose to sue, the local authority, after giving notice to him, might step into his place, and might sue because his water was fouled. They might not sue because Mr. Barwick's water was fouled, unless they gave notice to Mr. Barwick; they might not sue because the Vicar's water was fouled, unless they gave the Vicar notice. It was only substituting the local authority for the particular person, and to speak of the necessity of giving notice to them all was a perfect fallacy. As to the first proposition—namely, that a stream was not covered by the Act—he thought it unnecessary to say anything. He pointed out at the trial that the words "water belonging to" a person were loosely used, because flowing water, strictly speaking, did not belong to anybody; it belonged to a person when it was caught or impounded. In the popular language used in the Act, however, it was perfectly clear that the person who had the right to the use of the water was meant. Upon these grounds he submitted that the plaintiff was entitled to judgment.

Justice LUSH said the clause was not framed with so much precision as it might have been, but he thought he was giving to it the effect which the statute intended when he held that Colonel Stansfield was a person entitled to sue for this penalty. He agreed that there could be but one penalty. It was not a penalty to be recovered by every person whose water was fouled; it was one penalty only, and this, like every other penalty, was to be recovered by the person who first sued, and followed up the case to judgment. That would form a complete answer by the Gas Company to any other action brought by any other person. It was objected,

in the first place, that the clause did not apply to a running stream. He could not at all follow Mr. Cave in that contention. The object of the clause was to protect flowing water from being impregnated with these noxious substances, and the first matter in the mind of the Legislature was a flowing stream. It then provided for the care of reservoirs, aqueducts, ponds, or other places for water. Clearly the intention was to prevent any water which might be used for public purposes being impregnated with these noxious substances, the "stream" being the very first subject matter mentioned, because it was very important that a stream should be kept free. He therefore could not at all agree that this meant a stream in the nature of a reservoir—something which did not run—nor could he agree in the next contention, that it must mean a stream the water of which was wholly vested in some particular person or company. The offence was clear. The foul water flowed from a pipe directly into the stream, but at a part of the stream which was owned, one moiety of it by the Gas Company, and the other moiety by the Vicar. Then it proceeded through the land of Mr. Barwick, and so on to the land of Colonel Stansfield, who was the owner of the soil on both sides of the stream; therefore the entire flow of water was his riparian property. The next objection was that the words "wilfully does any act connected with the making or supplying of gas whereby the water in any such stream . . . . is fouled" could not apply to mere riparian proprietors, but could only be applicable where the entire water of the stream was vested by Act of Parliament in some individual. It clearly was an offence if the gas-washing was suffered to flow into any running stream, no matter to whom it belonged. Then as to the persons who were entitled to sue. Mr. Cave contended that the words "whose water is fouled" applied to absolute ownership, and must be restricted to cases where the company or individual happened by some prerogative or parliamentary power to be the absolute owner. He did not think this was the sense in which the words were used in the clause. It was a popular mode of speaking of the riparian proprietor who had the sole use of the water of a flowing stream as it ran through his premises, and who was entitled to use as much of it as he reasonably required without infringing on the rights of any of the riparian proprietors below. They were the persons here denoted by the words "whose water." The water was fouled. It first belonged to the Vicar, next to Mr. Barwick, and then to Colonel Stansfield, and each of these persons was a person designated by the words "whose water is fouled." The consequence of this would be that unless the matter were restricted to one of these riparian proprietors, every one of the riparian proprietors whose water was fouled would be entitled to sue for the penalty. He could not help thinking this was the meaning of the clause. It was quite clear that every one of these proprietors was entitled to his common law action for damage done to his water. The words "the person" really meant any person. It first pointed to the owner of the water at the spot where the fouling substance was conveyed into the stream, next "the person"—if it was not conveyed directly into his water—"into whose water such substance is conveyed or flows, or whose water is fouled by any such act as aforesaid." That would give to either of the riparian proprietors the right to sue for the penalty which was undoubtedly assumed to have been incurred when the act was committed, causing this noxious matter to run into the stream. This case must follow the principle of ordinary cases where a penalty was inflicted, and where the first person who sued for it became entitled to sue. The Gas Company would, after judgment had been given in favour of that person, be protected from being sued for the penalty by any other person. For the reasons given he was of opinion that Colonel Stansfield was entitled to recover the penalty as well as the £100 damages. He must, therefore, give judgment for £300 and costs.

Mr. Wills asked for an injunction.

Justice Lush: Has the nuisance been discontinued?

Mr. Cave: Yes.

Justice Lush said there was no need for an injunction. On the other point he remained of the same opinion as at the trial—that the clause was not confined to water which was already in a pure state, because then it would be very difficult to say in what cases the Act of Parliament would have any application at all. It was quite enough that the Company made the water in question more foul than it was before.

Mr. Cave asked his lordship to stay execution if within a certain time notice of appeal was given.

Mr. Wills said there was no reason why the £100 and costs should not be paid.

Justice Lush said all but the £200 should be paid, and as to this he would stay execution for a week.

MARKET BOSWORTH PETTY SESSIONS.—Wednesday, May 5.
(*Before the Hon. and Rev.* A. Byron, *Chairman, and a Bench of Magistrates.*)

THE PAYMENT OF RATES UNDER THE LIGHTING ACT.

An important decision was this day given in a case in which the Overseers of Ibstock claimed £2 12s. 5½d. from Mr. W. Haywood, a farmer, as his contribution to a lighting rate made in December last.

Mr. Dewes, who appeared for the Overseers, said the case came before the Bench on the 14th of April, when the rate was declared invalid. This was in consequence of the way in which it was placed before the Bench. It was a serious matter for the parish, and if Mr. Bland, who appeared for the defendant, would consent to submit a case for counsel's opinion to test the validity of the rate, they would bear the expense of the same.

Mr. Bland objected to this course on the ground that he was there prepared to meet the case.

Mr. Dewes said he could not go on further with the case, as he was not in a position to prove the adoption of the Act.

The Bench dedcied that, as this was so, they must refuse to issue a distress warrant.

Burton-on-Trent Corporation Gas Supply.—It was stated by the Chairman of the Gas Committee at the last meeting of the Burton Town Council, that the make of gas had increased 38 per cent. during the past five years. It was 34 per cent. more last year than in 1876, and last year the increase was 11¼ per cent. more than in the previous year.

Middleton and Tonge Improvement Commissioners Gas Supply.—At the last meeting of the above-named Commissioners, in reply to a question, the Chairman of the Gas Committee (Mr. Hilton) stated that the gross profits on the past year's operations at the gas-works were £3916, as against £3192 the previous year, being £724 in favour of last year. The net profit of the past year, after paying annuities and interest, was £275. There was no depreciation allowed, nor anything towards the sinking-fund required by the Local Government Board. The loss the year before last, after paying annuities and interest, was £501; and instead of that there was now a profit of £275, showing a saving, comparing the two years, of £776. The leakage had been decreased from 22¾ to 16½ per cent., showing a decreased leakage of 6¼ per cent. These results had been obtained with a sale of 2½ million feet less gas than in the previous twelve months. He considered all this very satisfactory, and with an increased consumption they might look forward to make considerable profit.

Miscellaneous News.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

A Meeting of the Members of this Association took place on Thursday last, at the Crystal Palace District Gas-Works, Lower Sydenham. The weather proved everything that could be desired for a day's excursion, and a large number of the members assembled at about half-past one. Having made the tour of the works and partaken of the hospitality of Mr. Gandon, the members proceeded to the board-room, where the chair was taken by Mr. J. Hunter, of Woolwich, the President of the Association.

The Chairman, in opening the proceedings, said a very pleasant and somewhat unusual duty devolved upon him—viz., to present, in the name of the members, a testimonial which had been subscribed for by them all—a testimonial to their worthy and much respected Secretary, Mr. J. L. Chapman. It was not necessary for him (the Chairman) to say much, for they all knew the Secretary as well as he did himself, and there could be no question that he was the right man in the right place. The progress of the Association since its foundation was very much due to his exertions, for however anxious the various members might be to promote its interests, they must all agree that Mr. Chapman was very much in the position of the engineer of a gas-works; and as very little could be done without a good engineer, so little could be done without a good secretary. He had much pleasure, therefore, in the name of the Association, in presenting the testimonial to Mr. Chapman, wishing him every prosperity, and that time might last with him as long as time was recorded on the face of the clock.

[The testimonial consisted of a very handsome marble timepiece, surmounted by a bronze figure. The clock bore the inscription: "Presented to J. L. Chapman, Esq., A.M.I.C.E., by the members of the Southern District Association of Gas Engineers and Managers, in recognition of his untiring services as Secretary of the Association. May, 1880."]

Mr. Eldridge said he must, as a member of the Testimonial Committee, interpose for one minute between Mr. Chapman and the meeting. The Chairman had alluded not only to his kindness, but to his ability as Secretary, and he was sure the members must all have been struck with the very able manner in which the business had been conducted by him. They very often had meetings which were quite of a conversational character, and yet at the following meeting, when the Chairman called for the minutes to be read, he had been astonished at the marvellously correct manner in which the result of the conversation had been reproduced. With regard to the testimonial, they all knew that Mr. Hunter, in his inaugural address, alluded to Mr. Chapman's very able services, and suggested something ought to be done in recognition of them. He was quite sure they all felt the force of the President's remarks, and there was only one word more he wished to say. Being appointed Treasurer of this matter, he had received letters on the subject from most of the members, every one of which was couched in terms of the greatest kindness, and expressing satisfaction that such a step was about to be taken. He should feel it right to hand those letters over to Mr. Chapman, for really if he had been in his position he hardly knew which he should have felt most gratified at—the testimonial itself, or these letters in regard to it. He would only repeat what the Chairman had said, that he trusted Mr. Chapman might long live to have the testimonial before him as a mark of their interest.

Mr. Gandon said he certainly took the initiative in carrying out the project, and in so doing endeavoured to impress upon all to whom he applied for subscriptions that the object was not to make a return to Mr. Chapman for his services, but simply to offer him a friendly recognition of them. The clock, although handsome enough in its way, was by no means a sufficient remuneration for all the trouble Mr. Chapman had taken; but he was glad to say that there was a universal response to the proposal, which showed a most friendly feeling. He could only hope that Mr. Chapman would long continue to give the Association the benefit of his services.

Mr. Broadberry said Mr. Gandon and Mr. Eldridge had mentioned all that he could state, except that, as a member of the Testimonial Committee, he wished to bear witness to the services rendered by Mr. Gandon in carrying out the matter. For himself, he had felt much pleasure in co-operating in it, for he had always respected Mr. Chapman, and, indeed, no one could come in contact with him, either at these meetings or on business matters, without being impressed by his kindness and affability. He could only say that the matter was taken up very warmly, and he felt sure that if it was necessary they would do the same again.

Mr. J. L. Chapman, in responding, said he felt that the splendid present the members had made him was far beyond his deserts, and he was very pleased to hear from all his friends that it was intended as a mark of friendship, and not as a reward for his services, because these would bear no comparison with it. He was sure all the members must have joined together to make so splendid a present, and it was a source of great satisfaction to him to know that they, as a body, felt he had done his best for the interests of the Association. It was only that morning he was thinking how the Association began. He met his friend Mr. Eldridge coming from the meeting of the British Association at Leeds. He did not know him beforehand, but on speaking to him in the railway carriage the question came up of starting such an Association; and so it arose. A few of them met together at Mr. Eldridge's house, and it was very satisfactory to know that they had now on the books 62 members. It was a great pleasure to belong to anything that succeeded. If a man had his feelings in the right place, especially when working for others, he liked the thing to be a success, and he felt in this Association, whilst Presidents had come and gone, he had been Secretary all the time, and he had been very pleased to see the Association go forward as it had. When he was a boy at school, on the fronts of the prizes that were given was put "*Jucundi acti labores;*" and it *was* pleasant to recollect difficulties overcome. He thanked the members very much for their present, which would remind him always of the Association, even if he were inclined to forget it, and perhaps enable him to work with more zeal in its favour. As he heard the timepiece strike out the hour each day, he had no doubt it would help him to remember always that time was short, and that therefore he should do good as long as he had the opportunity.

Mr. West said it was only right to thank the Committee for their kindness in carrying out the wishes of the members so admirably. They all knew it was a labour of love.

A vote of thanks to the Committee was proposed and carried unanimously.

The Chairman said he did not know whether it was proper for him to reply, being an *ex officio* member of the Committee; but he could only say that the work had been principally in the hands of Mr. Eldridge, Mr. Gandon, and Mr. Broadberry.

Mr. Gandon said it had been a great pleasure to them all, and he was only pleased they had brought it to so successful a result.

The Secretary then read the minutes of the last meeting, explaining

why the present meeting was held at Sydenham, instead of at Tunbridge Wells, as appeared by the minutes had been resolved upon. The minutes were confirmed.

NEW MEMBERS.

Mr. Sowood, of Gravesend, and Mr. Eldridge, of Oxford, were unanimously elected Members.

Mr. C. GANDON, the Engineer of the Crystal Palace District Gas Company, then read the following paper on

CONDENSATION.

In introducing the subject of condensation to you to-day, I am afraid I can offer no new matter or theories for discussion. When undertaking to prepare this paper, I had not read the excellent articles contributed by Mr. R. H. Patterson to the JOURNAL OF GAS LIGHTING in October and November last, or I should have hesitated to bring forward what may appear but a repetition of his views. My attention had, however, previously been drawn to the subject by reading the Rev. W. R. Bowditch's book on "The Analysis, Technical Valuation, Purification, and Use of Coal Gas," in which views are expressed much at variance with the present very general practice of condensation.

Mr. Bowditch says: "Hitherto *principles of science* seem to have had but little connection with condensation; but, if the gas were reduced to the proper temperature before it passed on to the scrubbers or purifiers, the true object of purification has generally been considered as accomplished. An engineer has thus expressed the general aim and opinion: 'Still further to separate all condensable vapours before allowing the gas to pass to the purifiers, a set of condensers, or coolers, is provided, through which the gas is made to circulate until it is reduced to a temperature bearing some approximation to the surrounding atmosphere.' There could be no more mistaken practice than the one commonly adopted, for it is in the power of most engineers to make a considerable difference in the illuminating power of all the gas they manufacture, by the adoption of a better mode of condensation." Mr. Bowditch continues: "The proper object of condensation is the removal from gas of substances produced in the distillation, which, for some reason, are not useful for the purpose of illumination, and the retention in the gas of all the substances which are useful as illuminants, and can be distributed with the gas." Farther on Mr. Bowditch says: "At present most manufacturers of gas take the best means with which we are acquainted for removing hydrocarbon vapours from gas. They cool their gas and hydrocarbon vapours down to 60° or 70° Fahr. (and in some cases lower) as quickly as they can, and the form of condenser which will do this most quickly and certainly is the one generally preferred. No suspicion seems to cross their minds that they are enabling the tar (*i.e.*, the heavier oils) to dissolve out from the gas, and carry down with it the vapours of light hydrocarbons which they ought to retain in their gas with the utmost sedulity."

I have quoted thus at length from Mr. Bowditch's work because his remarks appear to me to describe the process of condensation as it is still very generally understood and applied. He points out the necessity of separating the gas from the tar as quickly as possible, whereas, and particularly of late years, the practice of keeping the two in contact with the gas as long as possible, with the view of enriching the gas and preventing the deposition of naphthaline, has found much favour. It would appear easy to determine by experiment which of these two theories is correct; but if, as I think, the truth lies between the two, it is by no means so easy to arrive at the most favourable conditions. It seems certain that the attractions which the gas or the tar possesses for the volatile hydrocarbons are so nearly balanced, that very slight changes of condition suffice to cause them to be transferred from the one to the other. So far as the hydrocarbon, naphthaline, is concerned, it is much to be doubted whether its permanent retention in the gas is possible.

In a paper read by Mr. James Watson before the British Association of Gas Managers in 1874, in which he advocates prolonged contact between the tar and the gas, he says that "naphthaline can be retained in the gas in the shape of vapour, and delivered at the consumers burners as a valuable light-giving constituent." This, I venture to think, is a mistake. Experiments have convinced me that if naphthaline exists in the gas beyond a certain amount, it will be deposited somewhere in the solid form before the consumers burners are reached. Whether it is caught by the tar, deposited in the apparatus or connections on the works, or carried forward into the district, may be a question of the treatment of the gas during the processes of condensation and purification; but if the gas is super-saturated with naphthaline, it will, I believe, be deposited somewhere before it reaches the consumers burners. A gas of high illuminating power—that is, rich in volatile hydrocarbons—will retain a comparatively large quantity of naphthaline in suspension or combination, but any excess beyond the saturating point will be deposited somewhere; and it seems that, with our present knowledge of the subject, the object should be, not to keep the naphthaline in the gas, but to remove the excess of it with the least inconvenience. For this purpose the prolonged contact between the tar and the gas may be useful, as the tar takes up the naphthaline and removes it from the apparatus instead of its being deposited therein in crystals; but, unfortunately, the tar seems to have the objectionable habit of abstracting from the gas many of the other more volatile light-giving hydrocarbons. The prolonged contact between the tar and the gas seems, however, only partially successful in removing naphthaline, for at the Crystal Palace District Gas-Works, where considerable trouble is taken to ensure this contact, deposits of naphthaline are found in other parts of the works and in the district; but it must also be admitted that the tar is found heavily charged with naphthaline, a part of which would probably be otherwise deposited if the tar were sooner removed.

Mr. Bowditch's experiments seem clearly to prove that the contact, at *low* temperatures, between heavy tars and gas is injurious to the illuminating power of the latter. He says: "I have passed gas through heated heavy coal oil boiling at about 400° Fahr., and have found its illuminating power identical with its illuminating power before it was passed through the oils. It gave up nothing to them, and it took up nothing from them. I have also passed gas through the same kind of oil at ordinary temperatures, and have had its illuminating power reduced to less than one candle for a consumption of 5 feet per hour; whereas before passing the gas through the oil it had an illuminating power of 13 candles." Of this I have also satisfied myself by passing gas through tar taken from the hydraulic main, when the illuminating power has been invariably reduced thereby. Experiments made with the lighter tars taken from the condenser and washers have not, however, given me conclusive results. In some instances the gas has appeared slightly improved, but at least in no instance has it been deteriorated by the lighter tars. These results point to the necessity of the early separation of the gas from the tar condensed at high temperatures; but whether it may be beneficial to prolong the contact with the lighter tars does not appear to me quite certain.

From these considerations it is evident that the condensation of gas is not a simple question of reducing it to a given temperature, and indeed it is doubtful how far the actual *cooling* is necessary for the separation of the tarry vapours. I do not mean to infer that the cooling of the gas to a temperature approaching that of the atmosphere is not necessary for other purposes, for this has an important bearing upon the subsequent washing or scrubbing processes, as the amount of sulphuretted hydrogen and carbonic acid which the liquor or water used therein will take up depends greatly upon the temperature both of the gas and the liquor; indeed, above certain temperatures, the liquor will, as is well known, give off these impurities instead of absorbing them; but, so far as the tar is concerned, my experience is that no amount of cooling will remove all traces of it from the gas. It has been supposed that globules of gas surrounded by a thin film of tar remain floating in the gas, and that for the removal of this tar the globules must be broken up. Upon this principle the condenser of MM. Pelouze and Audouin is designed. The gas is forced through a series of finely perforated plates, and impinges upon each one in succession. In this way it is forcibly broken up into fine streams, and the tar is most effectually removed. It has been thought that the illuminating power of the gas would suffer under this rough treatment; but French engineers state that such is not the case. Livesey's washer acts upon the gas in a similar manner, by splitting it up into fine streams, and it is found that, however efficiently the gas may have been cooled, considerable quantities of tar are removed in the washer, and I have certainly not found it to have any injurious effect upon the illuminating power.

To determine what amount of condenser power is necessary, it must first be decided what duties this apparatus has to perform, and it seems that these duties have been very generally over-estimated, in the vain endeavour to remove all traces of tar by simply cooling the gas. Attention may here be drawn to the comparatively small amount of cooling action which the condenser proper exerts upon the gas. The temperature within the retorts may be taken at from 1800° to 2000° Fahr., and yet in the hydraulic main the temperature will be found to be only 140° to 180° Fahr., while at the inlet of the condenser it is reduced to, say, 110° to 120° Fahr. Various authorities have given an air surface of 6 to 10 square feet for every 1000 feet of maximum daily make of gas. The lower quantity will, I think, be ample for cooling the gas down to 50° or 60° Fahr. at the condenser outlet. At the Crystal Palace District Gas-Works the maximum daily make during the past winter was 2½ million cubic feet. The required condenser area for this, at the rate of 6 feet super. per 1000 cubic feet of gas, would be 15,000 feet super.; but the actual condensing surface was as follows:—

Horizontal mains round retort-houses	6,700 ft. super.
Underground main to condenser	4,000 „
Condenser proper	5,000 „
Total	15,700 ft. super.

With this the gas was easily kept at a temperature of about 60° Fahr. at the condenser outlet. The underground main of 4000 feet area might almost be left out of the calculation, as it exercises but little cooling power.

Much has been written and said as to the advantages of different forms of condensers; but, regarded simply as *coolers*, it would seem to matter little whether they be horizontal or vertical, annular, cylindrical, or of any other shape or design. Sufficient surface must be provided to reduce the gas to a temperature approaching that of the atmosphere, and this may be obtained by any of the forms introduced. It may be said that greater economy of construction is attained by some; but, if this is a matter of primary importance, the ordinary pipe condenser, vertical or horizontal, will perhaps obtain preference. Other forms may do the same amount of work, occupying less space, or with less surface area, but the making and fitting of the parts will be more expensive. Wrought-iron annular condensers have been approved of by some, as, from their thinness, they transmit the heat more readily than cast-iron ones; but it is doubtful whether, for a given amount of work, their construction is more economical, and they are certainly more liable to decay.

Messrs. C. and W. Walker have an excellent design for a wrought-iron annular condenser which combines the most recent improvements, and forms a compact and neat-looking apparatus. By an arrangement of side pipes, the gas is made to *descend* all the annular pipes in succession, instead of circulating alternately up and down them, and it thus meets the ascending currents of air in the inner tubes. A throttle-valve is also fixed at the bottom of each inner tube, by closing which, to prevent the circulation of the air, the power of the condenser may be varied. In the latest forms of this condenser Messrs. Walker have added a pipe or pipes fitted with perforated discs or trays for splitting up the gas into fine streams for removing the last traces of tar by an action similar to that of the French condenser or Livesey's washer, and this furnishes another proof of the necessity for other means than mere cooling of the gas for the complete removal of the tar.

There is one point connected with condensation which merits attention, and that is *slow-speed condensation*. This is best illustrated in Cleland's slow-speed condenser, as described in "King's Treatise on Coal Gas." It consists mainly of an ordinary vertical condenser, but instead of the gas circulating through each pipe in succession, the pipes are connected by a box on the top, and the gas descends simultaneously through the whole, thus moving at a very slow speed. The lower part of each of the vertical pipes is made to do duty as a scrubber by being filled with a series of wooden discs or arms; but this seems to be no part of the slow-speed principle, and it is doubtful whether the scrubbing operation could not be more conveniently performed in a separate apparatus. I am not aware whether this form of condenser has been much adopted, but it appears to be a simple and efficient means of applying the slow-speed principle, which is advantageous not only in the condenser but in all the purifying apparatus.

Whatever form of condenser may be adopted, means should be provided for putting some portions out of use, so as to accommodate its power to the ever-varying conditions of temperature and volume of gas to be operated upon. This may easily be effected, and thermometers should be provided for ascertaining the temperature at different parts.

Assuming that contact between the gas and heavy tars at comparatively low temperatures is injurious to the illuminating power, it will be seen that it is desirable to separate the gas as soon as possible, at least from the first condensed portions of the tar, before the temperature of either is too much reduced. This may be effected either by the total abolition of the hydraulic main, or by speedily withdrawing the tar from it, and supplying its place by liquor. Whether it may be necessary to provide further means for separating the tar from the gas before the condenser, does not seem quite so evident; but it may be safe to conclude that all contact between the tar and the gas, except, perhaps, the lightest portions of the latter, is liable to injure the illuminating power. It also seems desirable to abandon the attempt to entirely remove the tar by simple cooling, and to adopt some other means for that purpose. If the French condenser could be used while the gas is hot, there is reason to think that it would be very efficient; but there seem to be difficulties in so applying it, as the gas should be *forced* through it, which could not be conveniently done except by the use of a jet exhauster. Breeze scrubbers, of course, serve this purpose; but they become easily choked if the gas contains much tar, and their efficiency is thereby greatly impaired, so that after a time tar will find its way into the purifiers.

The desirability of abolishing the hydraulic main is at present occupy-

ing much attention, but no efficient means seem to have been as yet devised by which it can be satisfactorily dispensed with. It is generally admitted that the pulsations caused by the dip-pipes in the hydraulic main are injurious; but they perform so important a service in preventing the back-flow of gas and the entry of air, that one is reluctant to give them up until some other equally simple and efficient means for the same purpose can be substituted, and most of the plans at present devised have the objection of not being self-acting. Much of the inconvenience attending the use of dip-pipes is due to the accumulation of thick tar in the hydraulic main. If this is removed and replaced by liquor, the double object of shortening the contact between the gas and the tar, and of decreasing the pulsations caused by the dips, will be attained. The injurious effect of the gas having to force its way through the thick tar in the hydraulic may easily be seen by fixing a pressure-gauge to the mouthpiece or the ascension-pipe of a retort in action, when it will be found that with a practically steady gauge on the hydraulic there will be an oscillation of 4 or 5 inches, or even more, in the gauge in the ascension-pipe. This may be obviated by keeping the hydraulic charged with liquor, and making the seal as shallow as possible, and perhaps under these conditions it may be wise to retain our old friend the hydraulic main, if not constantly in action, at least for use when necessary—that is to say, to have an arrangement for working with or without dips at pleasure. Having this in view, I last year tried at the Crystal Palace District Gas-Works an arrangement consisting mainly of a double bridge or dip-pipe, one end of which acted as an ordinary dip, while the other end, terminating at the top of the hydraulic, allowed the gas to enter without passing through the seal. This latter was closed or opened by a heavy ball-valve, worked by a lever in connection with the cross-bar of the mouthpiece. When the retort is closed and in action, the valve is open; but while being charged it is closed, and the retort is thus sealed in the ordinary manner, and should the valve by any neglect be left closed after charging, the gas continues to pass through the dip. Of the working of this arrangement I cannot as yet speak with certainty. For some months, during which it was exclusively used and the results carefully observed, the average make of gas was visibly increased, and the deposit of carbon in the retorts was less than usual; but it must be said that these improvements were in part due to the retorts being new. Much trouble was also encountered with stopped ascension-pipes, owing to higher heats than usual, particularly in the front parts of the retorts, which led also to very thick tar in the hydraulic, and consequent clogging of the valve at times.

These remarks upon the hydraulic main may not appear to belong to the subject of condensation; but if the early separation of the tar and gas bears a part in the operation to follow, I think that condensation may be assumed to take place largely in the hydraulic main, so long as it is retained in use, and I have referred to it in order to point out more strongly the desirability of the early removal of the tar. The whole subject, from its apparent simplicity, seems to have been somewhat overlooked; and although this paper may not contribute much to the information already possessed, I trust it will lead to a discussion from which practical and important information may be obtained.

Discussion.

Mr. G. E. Stevenson (Peterborough) thought they were all indebted to Mr. Gandon for the very exhaustive paper he had just read. He must have devoted considerable time to the preparation of it, and there was a good deal of matter in it for discussion. It had become somewhat the fashion lately to depreciate the knowledge of gas engineers on this subject, and to say they had neglected to follow it out from a scientific point of view. At a meeting of gas managers he attended a little while ago a paper was read on the subject, and, after several speakers had expressed their views, in the course of discussion one gentleman said that up to the present time they knew nothing whatever about it, and they had made no progress in their knowledge of it. He hoped this would not be found to be the case now. The reason why they were not able to arrive at any very definite opinion as to the best process of condensation resulted, he thought, from the fact that hitherto it had been regarded simply as the act of cooling the gas. Now it must be apparent to every one who considered MM. Pelouze and Audouin's condenser that in the minds of those gentlemen condensation did not mean cooling, but apparently separating the tarry impurities from the gas. Whether it was best that this should be done while the gas was hot or cold, was a secondary consideration. The question of keeping the gas in contact with tar seemed to be the point on which everything turned, and he thought they were now coming to see that it was a mistake to keep the tar too long in contact with the gas. The reason for this notion was that they did not understand how naphthaline was to be removed, or how it was the deposit of it occurred. Those who proposed keeping the gas and tar in contact with one another imagined that the naphthaline alone was absorbed by the tar, without the absorption of the lighter hydrocarbons; but they now found this was not the case. Where the heavy hydrocarbons were absorbed by the tarry liquid, the lighter ones were absorbed also, and in this way the illuminating power of the gas was reduced. They would all agree that the deposit of naphthaline in the main-pipes and connections chiefly occurred with gas of high illuminating power, and where it was of lower power very little trouble was experienced. If this was so—he would not say for certain that it was, and he saw some gentlemen shaking their heads—the explanation might be that the lighter hydrocarbons were absorbed at the same time as the heavy ones. He thought it was a fact that heavy hydrocarbons, especially naphthaline, could not remain in suspension in the gas, except in connection with a certain proportion of light hydrocarbons, and that where the light hydrocarbons were either not present in sufficient proportion, such as the benzole vapours, or were absorbed by long contact with tar, the heavy hydrocarbons would also follow. But if the light hydrocarbons were absorbed by contact with tar, the heavy ones followed at the same time, and there was no deposit to speak of; but the gas was of comparatively low illuminating power. If the gas were separated from the tar immediately, and were of rich quality, it depended then on the proportion of light hydrocarbons to heavy ones whether they could be held in suspension or not. This was only a theory which he could not prove by experiment; but it appeared to him probable for this reason—they were all homologues of the radical CH_2, and it appeared to him that possibly the light hydrocarbon vapours became condensed by cooling, and altered their condition, and heavier ones were formed. It did not appear that they had any reason to suppose the gas remained exactly in the same state as it was in when it left the hydraulic main or the retorts during the whole of the cooling process. In distilling tarry matters, first of all the light hydrocarbons were obtained, and then the heavy ones; but if all of them were mixed together again and allowed to cool, most probably some dissociation or association would take place which would alter the proportionate quantities of those vapours. He thought, therefore, that instead of keeping the gas in contact with the tar, they should attempt to retain these vapours by slow condensation rather than by rapid cooling, which tended to deposit naphthaline. He had just been designing a means of doing away with the hydraulic main altogether, and substituting for it a dry receiving-main with a separate tar-main. In this arrangement the heavier portion of the tar was separated from the gas immediately on leaving the ascension-pipes, and in connection with it there was a self-acting valve-seal, which shut off the connection between the receiving-main of the retort when the latter was opened. The only question as to this valve was whether it would stand the test of practical work.

Mr. A. F. Wilson said it seemed to him there was no fixed principle in condensation, but a great deal of variability. The atmosphere was varying, and they were always encountering a different degree of temperature; but he thought it was generally understood that certain bodies were volatile at a certain temperature, and given the fact that the temperature was reduced below that degree, those bodies became condensed into a different form to that which they occupied previously; they might become a heavier vapour, or a liquid, or ultimately a solid. There were so many things about this matter that they did not know, that its discussion could not but be useful. One point which seemed often overlooked was the possibility of latent heat existing in a body. Mr. Gandon had told them that the temperature in the furnaces was about 2000° Fahr., and the effluent gas about 180° Fahr. Now, they could not understand how the gases were so much under the temperature of the furnaces, and this point was worth inquiry. They all knew there was such a thing as latent heat—that water could be brought up to 212°; but he thought it was a very interesting point to study, and if they knew more about it they might possibly know more how gas should be condensed. Another point Mr. Stevenson had very properly brought forward was that gas really contained naphthaline when it left the retort, or this deposit gathered in some respects in its passage through the pipes. They all knew that naphthaline was a hydrocarbon, but was it formed in its passage through the pipes, or was it a distinct body produced by the distillation of coal? This was a point he did not know much about, but he had always observed that naphthaline was very apt to condense in bends and corners where it encountered a sudden gust of cold wind, and of course it must exist somewhere before it was deposited there. He fancied that in coming to these corners in the passage of the gas through the pipes there was a certain crowding together of the molecules of the gas, and possibly heat was evolved, and that other combinations might take place, and consequently naphthaline might really be formed in its passage through those points. There was no doubt that condensation was a most important question, and that naphthaline was a most disagreeable thing to deal with.

Mr. Eldridge said he was rather struck with Mr. Stevenson's remark about the richer gas producing naphthaline, and the poorer gas not doing so. He would not go into the chemistry of the question, but as a matter of experience he would say that when they used to make gas of 11 or 12 candle power, about every day they had to blow out the inlets and outlets; but ever since they were compelled to make their gas of 15-candle power they had never been troubled with naphthaline.

Mr. Stevenson said he believed he was wrong in stating that the richer gas created a greater deposition of naphthaline than the poorer. He had learnt so at one time, but he found he was wrong, because in the richer gas there were more of the lighter hydrocarbon vapours; there was more of the benzole vapour, and it was chiefly from benzole vapour and the acetylene which was in gas that it obtained its light-giving properties. The point he wished to bring out was the power of the lighter hydrocarbon vapours, especially benzole, to hold in suspension the heavier vapours and others. If this were true, it would explain the fact that richer gas did not deposit naphthaline so much as poorer.

Mr. G. Livesey regretted he was not in time to hear the whole of the paper, and was not, therefore, in a position to discuss it, though he was quite certain, from hearing the latter part, that it was a very good one. With regard to the question of condensation, his own experience was simply this, that sudden cooling was eminently productive of naphthaline. Some years ago the late Mr. Young, of Birmingham, in going over the South Metropolitan Company's works, and seeing the water condenser with the pipes under water, observed what a capital means of condensing he (Mr. Livesey) had. Mr. Young told him he could not condense too much, and, having an unlimited supply of water, asked why he did not turn the valve on full, and let the water flow through, and keep the condenser thoroughly cold. He did so, and in a fortnight every pipe under the purifiers was so filled with naphthaline that he had to cut them in all directions to clear them. Of course he never tried the experiment again, but he attributed the effect to the sudden cooling of the gas. What was wanted in condensers was the power of controlling the condensing or cooling action. Many condensers were defective in this respect, as they might be too cold in winter, and too hot in summer. Certainly for effective condensation water was wanted as well as air. The pipes might be exposed to air round the retort-house, or the gas might go through an annular condenser; but the process should finish with water. His plan had been to have a tank with pipes going backwards and forwards, with seal-cups at the lower end, and the water travelling in the opposite direction to the gas. The result was that as the gas entered the condenser it came in contact with warm water, and this could be had as warm as was wished for by regulating the quantity. If very little water were allowed to flow through, it would be nearly the temperature of the gas where the gas entered, whereas at the other end it would be the ordinary temperature of the water as it came from the supply. This gave efficient means of controlling it. His experience had accorded with that of Mr. Eldridge, that if they had a quantity of naphthaline, the best way to get rid of it was to improve the quality of the gas. He could not say that he had much faith in the theories put forth as to the action of hydrocarbons. Gas managers were very much in the dark on this point, and the theories he had seen propounded generally turned out to be wrong. The first he had heard of the absorption of naphthaline by tar was by a man named Thompson, some thirty or more years ago. He found that tar under certain conditions absorbed naphthaline from the gas, and he recommended that all gas should be allowed to flow with the tar for this purpose. Of course, in those days, nothing was known about hydrocarbons. It was very necessary to condense slowly, and to avoid all sudden cooling of the gas. As to separating the tar and other things from it, he adopted a plan some years ago which he found of great use. The main from the condenser had a rise up to the exhauster, and the tar which accumulated in this main had to fall against the current of gas. It was an 18-inch main, and he found they had to increase the vacuum of the exhauster very largely, and they could not at all make out the cause of it, until one night the exhauster stopped, and on opening it they found it full of tar. On examining the main between the condenser and the exhauster, they found it also was full of tar, all but a little segment of 3 or 4 inches deep, and how the gas got through at all was an enigma. From that time he thought they might adopt some means of separating the heavier part of the tar from the gas as it left the condenser. Mr. Stevenson was quite right; a mere cooling did not separate the tar effectually. He (Mr. Livesey) had a series of five tubes 4 feet in diameter and 20 feet long arranged in such a manner that the gas passed simultaneously through them after leaving the condenser proper. In this way it was brought almost to a state of rest. The exhausters had worked without giving the slightest trouble ever since this plan was introduced. Any one might put his ear to this apparatus, and hear the tar falling like rain. It

separated just sufficient of the tar to prevent its clogging or injuring the exhauster, and yet left a sufficient quantity to lubricate it. If it were all removed before it reached the exhauster, in the course of a short time the exhauster would become clogged with some compound of the gas or oil, and a great deal more oil would be required for lubrication. This was Mr. Corbet Woodall's experience as well as his own. He had now a balanced gasholder, 30 feet in diameter and 15 feet deep, between the condenser and the exhauster, which produced a double effect; it allowed the tar time to separate from the gas, and it entirely annihilated the oscillation caused by the exhauster, so that at the retort there was no oscillation whatever, except that due to the dip-pipes.

Mr. MORTON said the last speaker had referred to one very objectionable thing in gas-works—namely, bringing the liquid products, such as tar and liquor, against the stream of gas. This had been under his attention considerably of late, and he thought the habit they had recently acquired of increasing the height of the ascension-pipes rather tended to perpetuate it. He thought if contact of the gas with the tar was objectionable, they were going in the wrong direction, and it appeared to him that if it was desirable to separate the tar from the gas as soon as possible, they should turn their attention to descending ascension-pipes, if he might use such a term. The gas in the present ascension-pipes was continually coming in contact with a very much larger quantity of tar than if the tar and gas were carried away together. Perhaps some one who had a new retort-house to plan would see if this could be done. No doubt there were difficulties in the way, but he did not think they were insuperable.

Mr. WEST said that he for one believed in the gradual condensation of gas, and at the same time in removing the tar as soon as possible, he was going to say from the hydraulic main, but he did not believe now in the hydraulic main. He should like to see a pipe simply to carry off the tar as soon as it was condensed immediately it left the ascension-pipes, which would probably in future be shorter than they had lately been putting up. When the members of the Association were at the Maidstone Gas-Works some time ago, they saw that it was impossible to remove the whole of the tar by condensation. The former idea used to be that the object of condensation was really for the removal of the tar; but they saw there that when he was passing the gas, as it was being manufactured, from the new works to the old ones, although there was double and perhaps treble the length of pipe necessary for condensation, still there was a retention of tar in the gas. For this purpose he found Mr. Livesey's washer very useful, and he considered it more valuable than Pelouze and Audouin's condenser, because it not only removed the tar, but also performed the office of purification, and removed a great portion of the carbonic acid and sulphuretted hydrogen. He also agreed with Mr. Livesey as regarded the means of cooling by water. He had one of Morris and Cutler's condensers arranged, and he found the temperature could be controlled very readily by adjusting the water supply. He also purposed covering these condensers, and in fact he had arranged the whole of his condensing and scrubbing power, so that eventually they might cover them, because there ought to be the means of preventing the extreme heat of the sun in summer weather, and the extreme cold of winter.

Mr. PRICE (Hampton Wick) said he could bear testimony to the fact that by condensation tar could not be absolutely removed from gas. Assuming that the temperature of the gas, when it left the retorts, was as had been stated by Mr. Gandon, and that it was gradually reduced to, say, 76° Fahr. at the inlet of the condenser, yet at the outlet, the condensation being never so effective, tar would be found. The plan he had adopted was to carry a large main round the retort-house, and this main extended a great distance before it reached the condenser; and by the time the gas arrived there the temperature was about 70° or 76° Fahr., whilst at the outlet the temperature was reduced to about 60° Fahr., or lower, according to the weather. He had recently erected a powerful condenser, also a new scrubber; and he thought that by this condenser he should be able effectually to separate the tar from the gas, but he found at the outlet of the scrubber he had almost as much tar as from the outlet of the condenser. With regard to naphthaline, he was very little troubled with it, though he had heard a great deal about it. Nor was he troubled with stopped ascension-pipes. About once or twice in the year he had found naphthaline in the inlet of the gasholder; but this was easily removed by sluicing it with cold water. He was very pleased to hear that, by means of Mr. Livesey's washer, tar could be effectually removed from gas; and he hoped soon to adopt it.

Mr. F. LIVESEY desired to say one word about Mr. Morton's descending ascension-pipe. The idea had occurred to them at the South Metropolitan works. They had tried it, and it was not successful; but from what he recollected he thought it failed because they had not properly tried it. The whole of the gas was taken off from one end of the retort, and he supposed that this was the reason of the descending-pipe becoming stopped up. The waste tar on the mouthpiece had often been a source of great annoyance, especially when the heat was rather low. It was a matter he had often thought about, and he was glad that other people had also turned their attention to it. Perhaps they might now arrive at some conclusion. Mr. Gandon seemed to imply that there was always a certain quantity of naphthaline left in the gas. Now, many people must have noticed the difference between the illuminating power of gas in summer and in winter. In winter it required, as a rule, much more cannel coal to keep up a fixed illuminating power than in summer. Was not this, he asked, due to the naphthaline being burnt in the summer time in the form of vapour? Another point about naphthaline was that it was not only deposited in the pipes and converted into vapour in the hotter seasons of the year, but it was also capable of retaining sulphur compounds. If there were a testing-station that was connected by a pipe which became coated with naphthaline, this naphthaline would hold a certain quantity of sulphur compounds, and, if very hot weather arrived, the naphthaline vanished, and the sulphur compounds came with a rush. He thought probably this was the reason why gas managers experienced those sudden rushes of sulphur which were sometimes heard of, and could not be accounted for.

Mr. BRETT thought they were all agreed that gas should be brought down to the lowest temperature it was likely to come in contact with. He found that sometimes condensers were coloured with tar, and this was a matter of importance in the summer. He could not give the difference of temperature between one coloured with tar and one coloured white, but it would be many degrees, and he thought it was putting too great a strain on condensers to paint them black, and then expect to find the gas properly cooled.

Mr. ELDRIDGE said some twelve months ago Mr. West suggested a plan which he thought would offer a complete relief to the thick tar in the hydraulic main, but since then he believed he had abandoned it. He, however, had found it answer very well. The idea was to fix a 2-inch pipe from the bottom of the hydraulic main to the outlet of the hydraulic, between the square valve and the hydraulic. Before doing this they had been always troubled with thick tar accumulating at the bottom of the dip-pipe, and on opening the cap of the dip they found a cone of thick tar gradually forming. However, since they had adopted this plan of a 2-inch syphon, they had found the hydraulic perfectly free from tar.

Mr. G. LIVESEY asked if Mr. Eldridge had a deep hydraulic main.

Mr. ELDRIDGE said it was an ordinary square main, with a shallow bottom. At any time the cap over the dip-pipe might be taken off, and nothing would be found but liquor.

Mr. HAMMOND said if any gentleman would like to try a plan for getting the tar from the bottom of the main first, before the liquor, a simple way was to lap a strip of lead, say, 2 inches from the bottom of the hydraulic, fasten it on to the side bolts of the valve, with pieces of iron at the back to cement it up to the inside end of the hydraulic. This was a very simple plan, but very effective. The gas would go over the top of the lead, while the tar would be driven by the weight of the liquor under the bottom, and pass away at the outlet. The position of the lead could be altered at any time by a simple wire inserted through a plug-hole, if necessary while the main was in action.

Mr. ELDRIDGE thought the plan he had described was much better. The plug had only to be taken out, and the tar would run away at once.

The CHAIRMAN said the paper deserved the greatest possible attention, and he should have liked to say something upon it; but so much passed through his mind during the meeting that he hardly knew where to begin. One important point on which they might all agree was the necessity for cooling gas slowly. There was no doubt that in the past they had been in error in cooling too rapidly—in fact, if the object were to cool the gas as rapidly as possible, they ought simply to plunge it into cold water; but the illuminating power would then be much reduced. Condensation ought to be prolonged as far as possible. Gas would not give off its tar except under very peculiar circumstances, and fortunately Mr. Livesey and the French gas engineers who had been named had been able to hit on the right method of removing it. To cool the gas, and that slowly, was one of the most important points. One of the reasons for exposing gas to contact with tar was this. As Mr. Livesey had said, the idea was due to Mr. Thompson, who thought that the tar removed the naphthaline. Unquestionably it did so to a certain extent; but there was no doubt that it had often been carried to too great an extent. With reference to the formation of naphthaline, years ago, when gas in London was much lower in quality than at present, most of the Companies were troubled with naphthaline in their mains, sometimes to a very serious extent. Indeed, on one occasion he brought his whole works to a stand-still through the accumulation of naphthaline, by attempting to wash it with hot water. But since the quality of the gas had been raised from 12 to 16 candles, he found he had much less trouble with naphthaline than formerly; and indeed they scarcely ever saw it in the heavy dense state—nothing beyond a slight coating inside the pipe, perhaps ¼-inch thick, and only a little in the district unless a very sudden change of temperature occurred, and then in a slight form, which a man could get rid of by disconnecting the meter and blowing it with his breath. He would only say, in conclusion, that Mr. Gandon deserved their best thanks for his admirable paper.

Mr. GANDON, in reply to the observations that had been made, said he need not detain the meeting long, for most of the speakers had agreed with his remarks. He quite concurred with Mr. Stevenson that cooling, rather than condensing, was the proper term to use. As to the question whether the naphthaline was increased or decreased in proportion to the illuminating power of the gas, his own experience was that the higher the illuminating power the more naphthaline it would retain. He had made several experiments upon this subject, but he could not say they were conclusive. Mr. Eldridge also agreed with this view. As to his plan for removing tar from the hydraulic main, he had not taken it out by a pipe, but he was about to make several alterations in the apparatus, one of which included a similar plan to that described, for he felt sure it was very desirable to remove tar at once from the hydraulic main. Some one spoke of having the exhauster before the condenser, and he remembered the time when Mr. Beale's agents, in issuing instructions as to fixing the exhauster, recommended that it should be erected before the condenser. He tried that plan once, but he made a vow that he would never do so again. All the tar possible ought to be got out of the gas before it passed into the exhauster. Mr. West said he did not believe in the hydraulic main, and, though he (Mr. Gandon) had not reached so far as this, he must say he should like to get rid of it; but he first wanted some one to show him a good substitute for it. Mr. Price spoke of a pipe all round the retort-house, and they had an example of it at his works, that he was not much in favour of it; at any rate if it was used for keeping the gas and tar in contact for a long time. It did not matter much how the pipe was arranged, so that the gas and tar were not kept in contact longer than could be helped. With regard to the painting of condensers, they all knew that white colour would reflect heat better than black; but if they had too much condensing power they might very well paint the pipes black. Mr. Hammond described a kind of disc in the hydraulic main for compelling the tar to go under it and then escape, so as to prevent the liquor coming off first. They had taken two or three such things out of their hydraulic main, and he had strong reason to believe they were put in with the idea of compelling the thicker portion of the tar to flow away first; but he believed the result was that underneath these discs the main became completely stopped up, and instead of the thicker tar going away they had raised the level of the water in the hydraulic by about 2 inches. He should not recommend any one to try them.

A vote of thanks having been passed to Mr. Gandon for his paper,

Mr. J. CHAPMAN, sen., moved a vote of thanks to the Chairman, which was carried.

Mr. WILSON then asked permission to bring before the next meeting the results of Mr. Hislop's process for the revivification of waste lime, and to put on the table samples of the lime after it had been treated under the process.

The CHAIRMAN said the proper way would be to refer the question to the Committee, who would, no doubt, agree to Mr. Wilson's proposal.

Mr. WOOD (Hastings) said they should not separate without giving a vote of thanks to Mr. Gandon for the hospitality he had afforded them that day.

Mr. MORTON seconded the motion, and it was carried unanimously.

The proceedings then terminated.

WEST OF SCOTLAND GAS MANAGERS ASSOCIATION.

(*Continued from p.* 718.)

At the conclusion of the President's address, given in last week's number, the following business was proceeded with:—

ALTERATION OF RULES.

Mr. J. M'GILCHRIST (Dumbarton), in terms of the motion of which he had given notice at the meeting of the Association at Coatbridge, moved—"That a Committee be appointed to revise the rules, and at the same time to see that an arrangement is made whereby three of the eldest members of Committee should retire annually, and that the three retiring members should be balloted for in the same way as is done at the meeting of the North British Association of Gas Managers." In doing so he said: I may state that my reason for moving the adoption of this motion is that a good deal of our time at the yearly meetings has been taken up in arranging Committees. Besides, I think it is altogether desirable that the members of the Association, as a body, should say

whom they wish to represent them on the Committee, and I think the adoption of my motion will lead to the appointment of a thoroughly representative Committee. I may say that the Committee that has been appointed to-day appears to me to be a very suitable body to revise the rules of the Association, with particular attention to Rule 3, which bears on the mode of appointing the General Committee.

Mr. CARLOW (Port Glasgow), in seconding the motion, said he thought the rules should be revised, as there were certain clauses in them requiring modification and alteration.

Mr. M'GILCHRIST: I should like the members present to say whether or not the proposed change would be satisfactory. The purport of the change is that the Committee shall, previous to the annual meeting each year, prepare a list of members whom they nominate as suitable for the offices of President, Vice-President, Treasurer, and Secretary for the ensuing year; that the list shall contain the names of at least twelve members; that a copy of this list shall be forwarded to every member of the Association before the annual general meeting; that each member shall be at liberty to make an exception to the list, and substitute the name or names of any other member or members for each respective office; and that the number of names so selected or substituted shall not in any case exceed the number to be elected to the respective offices.

The motion was agreed to.

ADMISSION OF NEW MEMBERS.

Messrs. J. Cummings (Milnthorpe, Cumberland), J. Fullerton, jun. (Motherwell), John Marshall (Bellshill), John Robertson (Holytown), and D. S. Baillie (Mossend), were admitted members of the Association.

AMALGAMATION OF THE WEST OF SCOTLAND AND NORTH BRITISH ASSOCIATIONS.

The PRESIDENT: There has been some discussion on the proposal that the West of Scotland Association should unite with the North British Association, and the first point we have to consider is whether this Association feels inclined to change its present position.

Mr. M'GILCHRIST: I think it scarcely necessary to propose that the two Associations should amalgamate, because at the present time there is a feeling amongst a great many of the members of the West of Scotland Association that this Association should remain as it is. While such a feeling remains, I think it useless to consider the subject.

Mr. D. M. NELSON (Glasgow): I think many of the members present, like myself, do not understand the proposal. My impression was that this matter was shelved six months ago. If it is to come up at this meeting, we should have something before us. We might hear what proposal has been made, and on that the meeting would be able to express an opinion.

The PRESIDENT: The Secretary will read the minutes of the Joint Committee on the subject.

Mr. DALZIEL then read the minutes of the meeting of the Joint Committee held in Glasgow on Aug. 29 last year. There were present from the North British Association, Messrs. Robb, Terrace, Watson, Myers, and Mackenzie; and from the West of Scotland Association, Messrs. Mitchell, Stewart, Carlow, M'Gilchrist, Renfrew, Jeffrey, Fullerton, Young, and Johnston. The Committee of the North British Association "were unanimously of opinion, and recommended that amalgamation should take place." A proposal to this effect was moved by Mr. Robb, and on it a discussion arose. Eventually, it was proposed by Mr. Stewart, and seconded by Mr. Dalziel, that instead of an amalgamation of the two Associations, district Associations be arranged; that a Central Association be formed of which members of district Associations would be members; and that this Central Association be supported from the funds of district Associations. It was agreed that this motion should be laid before the meeting of the West of Scotland Association held at Bridge of Allan on the 18th of September last, for their consideration; and that the same be brought up at the meeting the following April, for decision.

The PRESIDENT: I think it would be a pity if the matter were fixed either one way or the other without having the whole subject clearly drawn out, and, as the question is important, I ask members to express their opinions.

Mr. D. M. NELSON: As a member of both Associations, I have no personal feeling in the matter; but, viewed on the broad principle of union, I think there is a great deal to be gained by amalgamation. I spoke to Mr. Stewart, and various members of both societies, about a year ago on the subject. I do not believe in merging the two Associations into one, because where the districts are scattered, and members live far apart, the Association not only becomes unwieldy, but it does not serve the purpose in view. In my opinion, if there is to be union it should be of the kind suggested by the Committee—that there should be a Central Association made up of members from various localities, and that there should be district Associations. These district Associations could meet yearly or half yearly to promote the mutual benefit and interests of the members, and the parent or Central Association could then hold meetings at such stated intervals as might be agreed upon, and as many as possible from all parts of Scotland could attend these large, influential, and important gatherings. These would be important in this sense, that you would have there the outcome of all the various district Associations. Supposing Scotland were to be divided into four parts. You would have the large Central Association to begin with; then you would have an Association in Forfarshire, taking in Aberdeenshire. Another in Inverness-shire; a third covering the ground of the Waverley Association; and a fourth the districts represented by the West of Scotland Association. From these districts the best members could be drawn to the Central Association, which might meet once a year. Such a subdivision of the country would be the means of adding greatly to the mutual improvement of managers, and would at the same time tend to reduce the expenses which must necessarily be incurred at present by travelling over great distances, and sometimes at great inconvenience. But union is strength in connection with every other undertaking, and it ought to lead to good results where the combination is one of gas managers. When I came to this meeting I had not the remotest idea of saying a word upon the subject, because I thought six months ago that the matter had met with the approbation of both parties. I shall be surprised if members can be found opposed to such an amalgamation as has been suggested.

Mr. NIVEN (Dunoon): Did the North British Association, as such, appoint a Committee to confer with the West of Scotland Association?

The PRESIDENT: I think we were invited to amalgamate with the North British Association. Have you any information on the point, Mr. Robb?

Mr. ROBB (President of the North British Association): The matter being left exclusively to the members of this Association, I do not think it right to say a word about it. You know what has been done in the North British Association. The subject was referred to a Committee to meet with a Committee of your Association, and the result of the meeting has been well detailed in Mr. Dalziel's minute.

Mr. HOGG: It was stated that it was thought advisable to amalgamate, but there was no discussion except what has been reported.

The PRESIDENT: I think that this matter is irregular, and that we shall have to wait until the subject has been discussed by the members of the North British Association, and until they send in a formal way asking us to amalgamate.

Mr. M'GILCHRIST: I do not think we should stand on the order of our going. If amalgamation is a good thing for the Association, we should agree to it; and if it is a bad thing, we should have nothing whatever to do with it. It is not proper to allow the subject to stand over any longer, and I think we ought to have the opinion of this Association one way or the other.

Mr. RENFREW (Langbank): As I understand the case, we have merely heard from the North British Association that they wish to amalgamate, and we do not know that they will fall in with it, and agree to district Associations in addition to the central meeting.

Mr. NIVEN: It is essential that this matter should be formally discussed by the members of the North British Association, in order that we may see what amount of heartiness there is on their side on the question of amalgamation.

Mr. DALZIEL: This has only been before the Committee of the North British Association. It ought to come before the Association itself before anything can be done.

Mr. NELSON: I think we ought to accept the proposal that the question remain over until the North British Association have had their meeting, and see how that meeting receives the report of their Committee.

Mr. ADAMSON (Airdrie): Seeing that the North British Association are going to have their meeting in July next, I think we ought to appoint a small Committee, leaving that Association to act in the same manner if they think proper. These two Committees could meet and prepare a statement pointing out the merits and demerits of the proposed amalgamation, and this could be printed and issued to the members prior to next meeting. If that were done, members could come up fully prepared to deal with the question at issue.

The PRESIDENT: As I understand it, the motion is that the matter be left over till the members of the North British Association express a desire for amalgamation, and the amendment is that a Committee be appointed to confer with a Sub-Committee of the North British Association to take the matter into consideration, and to prepare a report to be submitted to the members. The amendment has not been seconded.

Mr. NIVEN (Airdrie) seconded the amendment.

Mr. NELSON thereupon withdrew his motion, and Mr. Adamson's proposal was adopted.

Mr. M'GILCHRIST proposed that the Committee consist of the President, Vice-President, and Secretary of the Association.

Mr. DONALDSON (Edinburgh): I think at the North British meeting I proposed that the office-bearers should form a Committee to meet the Committee of the West of Scotland Association.

Mr. M'GILCHRIST: I recollect the circumstances. The Committee of the North British were instructed by the meeting held in Edinburgh last July to confer with a Committee of the West of Scotland Association with regard to amalgamation. These Committees have met, and we know the result. The Committee of the North British unanimously agreed to go in for amalgamation, and by a large majority the West of Scotland resolved to remain as they were. As I said before, an amalgamation that is not unanimous can never be successful.

Mr. WILSON (Saltcoats): Then I will move that this Association remain as it is.

Mr. RENFREW seconded this motion, and it was carried.

[The reading of papers was then proceeded with, the first one being by Mr. D. C. Niven, entitled "The Elaborate and Tedious Thermometric and Barometric Calculations relative to Coal Gas simplified." This and the subsequent ones we hope to give next week.]

MUNICIPAL CORPORATIONS AND WATER AND GAS SUPPLY.

Last Thursday there appeared in *The Times* a lengthy letter with the above heading, dated from Sheffield, and signed, "A Member of the Council of the Incorporated Law Society;" and this was accompanied by an article, the importance of which, looking at the possible source of its inspiration, warrants us in placing the full text of it before our readers.

The writer of the letter commences by stating that "there is a well-founded desire and growing necessity for municipal corporations to possess the right of public supply of water and gas within the limits of their districts;" and that there have from time to time been "spasmodic attempts on the part of corporations to obtain compulsory powers of purchase of private undertakings for the supply of water and gas." He points out that vast sums of money have been spent in applications to Parliament for special Acts for compulsory purchase, some of which have failed; others have succeeded, sometimes after repeated applications; but in all cases there has been an expenditure of money in parliamentary costs, fees to counsel, surveyors, and witnesses, and legal expenses of a most wasteful and unproductive character, "accompanied frequently by the creation of bitter local feeling wholly uncalled for and injurious to the community." As an instance, he cites the case of Wakefield, the Bills for the abortive schemes for a new supply of water to the town, and that for the ultimate purchase of the Water Company, having cost, according to his estimate, "more than £60,000," the whole of which expenditure went for nothing, and was wholly unproductive. He expresses the hope that, "now Sir W. Vernon Harcourt, with his accumulated knowledge of private Bill legislation, is at the Home Office, and Mr. Chamberlain, with all his practical experience, gained by long and active service in the Municipality of Birmingham and his warfare with water and gas monopolies, is in the Cabinet, some vigorous effort will be made to relieve Parliament in the matter of private Bill legislation, thereby setting free many of our legislators for work they are more competent to perform, and effecting a yearly saving to the country of vast sums of money now extravagantly and uselessly wasted;" and he concludes his letter in these terms: "I would suggest that as a beginning a general Act be passed authorizing any municipal corporation to purchase any private undertaking for the public supply of water or gas within its district, provided that (1) a resolution be carried, at a special meeting of the corporation, by a prescribed majority of votes; (2) that afterwards such resolution be confirmed by a majority on a poll of the ratepayers. After two such resolutions, let the corporation become entitled to purchase and the company to sell the undertaking; let six months be allowed for negotiations for an amicable transfer, and failing an agreement within that period, or within an extended time to be granted in a prescribed manner, let the undertaking be taken over on terms to be fixed by reference to a proper tribunal for arbitration—say the Railway Commissioners, who do not appear to be much overworked—and let the costs of such arbitration be borne in such manner as the tribunal shall adjudge. This provision as to costs would have a salutary effect in inducing the parties to exhaust all reasonable efforts to come to terms, and be a check upon exorbitant demands on either side."

The article, which appeared in the same issue of *The Times* as the letter, was as follows:—

The question of the Water Supply of the Metropolis, however it may be settled, is only a part, though an important part, of a much wider issue really affecting the whole country. It has become the business of the

Legislature to decide how far it is fair and how far expedient to compel companies which supply the public with necessary commodities like gas and water to sell their undertakings to local and municipal bodies. It is true that by the provisions of the Gas and Water Facilities Acts, 1870 and 1873, and the Public Health Act, 1875, local authorities have acquired certain rights of starting new or of buying up existing undertakings. But, on the one hand, the greater part of the field of operations is already occupied by the older companies; on the other, it is most difficult to obtain the assent of these companies to being bought out. A useful lever towards obtaining this consent has often been found in a clause providing for purchase by agreement by the municipality, to be inserted in the private Act conferring parliamentary powers on a company. Lately, as a correspondent elsewhere shows, owing rather to the watchfulness of local authorities than to the policy of the Legislature, such clauses have sometimes been insisted upon. But in the earlier Acts they are seldom present. When, therefore, the purchase of a gas or water company's undertaking is thought advantageous in the interest of consumers, the municipality, in the case of one class of undertakings, may use this power to purchase with considerable effect. It may brandish the clause in the face of any company when it seeks to obtain additional powers, and challenge the company to sell to a body who are prepared to give a more economical supply. In the absence of such a clause a corporation finds a well-armed antagonist in possession, ready to spend immense sums in defending his rights before a Parliamentary Committee, and always able in the end to recoup himself for this expenditure, however extravagant, out of the pockets of the ratepayers—the very people, in short, with whom he is in conflict. In default of an amicable arrangement—an event of rare occurrence—a private Act is the only weapon with which companies in this independent position can be brought to terms. Many municipalities, as those of Glasgow, Dundee, and Leeds, have succeeded in persuading Parliament to transfer gas or water undertakings into the hands of the consumers. But in these cases the enormous expenses of parliamentary litigation must be added to the price paid to the Companies, while where failure has been the result of the application to Parliament a dead loss results to the unfortunate consumers, who thus bear the brunt of the battle in either event. The public may have reason to think that better gas or water might be distributed at a far cheaper rate than that which they are paying; but they have no remedy except one attended by excessive risk to themselves. Naturally, therefore, it is a remedy which many local authorities shrink from attempting. Nor is the evil allowed to right itself by competition. Practically, where one water or gas company, armed with statutory powers, has occupied the field with its complete system of works and pipes, it has as complete a monopoly as any of those so common 300 or 400 years ago. Possession in such a case is really the proverbial nine points of the law.

In considering the question of the justice of compulsory purchase, it is impossible to ignore the rights of the proprietors of existing companies. They have invested their capital, with risk of depreciation or of total loss; by dint of economical management they have conducted their enterprise to a point where it begins to be a lucrative concern, and it seems harsh that a municipal body (which would naturally have nothing to do with them in the hour of danger) should swoop down on them in prosperity and exercise an option of purchase. It might be argued, at all events in the early history of such undertakings, that private investment and private enterprise in providing gas and water would be checked altogether by the admission of the principle that undertakings were liable at any moment to be bought up; but the almost certain advantage of such investments is now well assured, and the fair answer is that, while no one would wish investors to suffer loss on their investments (but, on the contrary, most people would be willing to leave them a handsome margin of profit), the time has now come when, in granting statutory rights of this nature to new companies, or fresh rights to existing companies, they should be treated as subject to the reasonable interests of the consumers, for whose primary benefit these rights were conferred. The capitalists who embark in these enterprises give no adequate consideration for the practical monopolies which they seek, and the very valuable proprietary rights which are granted to them. Thus, in the case of the water companies, the right is conceded of impounding and diverting water which was previously the property of the public, on the sole condition of distribution, and of appropriating streams and watersheds which afterwards are treated as belonging exclusively to the particular company. It is only fair to infer that, in conferring such powers and rights, Parliament has some other object in view than mere bounty towards private adventurers, to whom it is under no obligation; and that that object is the public welfare. The expediency in such cases of authorizing purchase by the public in certain cases is no less obvious than the right. There is a well-grounded doubt as to the propriety of the taking over of railways by the Government; but it has come to be recognized in the case of many large communities throughout the country that such a doubt does not beset the purchase of gas and water undertakings. Even a statutory limitation of the dividends of companies in the public interest is often evaded by unnecessary additions to capital, and consumers are the last to feel the benefits of increased revenues. On the other hand, where the municipality has the control of the water or gas supply, the consumers obviously enjoy all the advantages of co-operation.

In a letter which we publish this morning, from "A Member of the Council of the Incorporated Law Society," it is suggested that a general Act should be passed, authorizing the purchase of gas or water companies by the local bodies, subject to certain conditions as to the assent of ratepayers and the method of arbitration. This would be a somewhat heroic remedy, and open to the charge of injustice which usually attaches to an *ex post facto* law. There is greater reason in the complaint that it has not devolved upon some public department to protect the public interest in the case of applications by private companies for the grant of *privilegia*, nominally for the public benefit in the particular locality, but too often resulting in the imposition there of a most grievous public burden. It is no use crying over spilt milk; but the reflection must inevitably occur that much of the trouble and the bitterness now occasioned in London and many provincial communities, by existing monopolies in gas and water, and the rates charged for these necessaries of life, might have been obviated by an opportune attention to the future interests of the ratepayers as each Bill came before Parliament. The Board of Trade and Local Government Board have already devoted considerable time and care to the consideration of private Bills; but they have generally left the ratepayers helpless in the hands of the companies. Local authorities, too, have been daunted by the expense of appearing in the lobbies in defence of the interests of their respective communities; and their hands have been tied by the prospect, actually fulfilled in some cases, of having to pay the costs of litigation out of their own pockets. Hence the ratepayers have been in times past, and still remain, under considerable disadvantages in the battles fought before Parliamentary Committees. The time now seems to have come when Parliament itself should recognize practically in its work of private legislation, as it has recognized in the abstract by public statutes, that the supply of water and gas, affecting as it does so materially the health and comfort of every community, should, as a general principle, be given to local authorities where these desire to undertake it, and can show that they have the ability and the means to do so. A compulsory purchase clause, at the option of the local authority, should form part of every future Act constituting a gas or water company.

METROPOLIS WATER SUPPLY.

Deputation to the Home Secretary.

On Thursday last a deputation from the Commissioners of Sewers of the City of London had an interview with the Home Secretary (with whom was Mr. Dodson, President of the Local Government Board), as to the course that would be pursued with respect to the Water Supply of London, and to ask whether the Government intended to prevent any increase in the charge made to the ratepayers for water.

Mr. Robarts (the City Remembrancer), in introducing the deputation, said they represented the Commissioners of Sewers of the City of London, who thought it was time to take action with reference to the water supply. They would like to ask whether or not the Government would deal with this as a general question, or whether they would legislate to prevent an increase of the water-rates charged to the ratepayers with regard to the new assessment.

The Home Secretary said he would answer that question by asking another, and it was this. He understood the deputation represented the City Authorities, as contrasted with the Metropolitan Board of Works, with reference to this question.

Mr. Rudkin: Not in opposition.

The Home Secretary: Oh, no; but I take you as representing the City of London with respect to the water question. Of course, it became part of your duty to examine the proposals that were brought before the last Parliament. Did you examine the agreements that were entered into as the basis of the Metropolis Water-Works Purchase Bill?

Mr. Rudkin: We did not.

Mr. Robarts: When we found that Parliament decided not to proceed with the Bill we did not go into the inquiry.

The Home Secretary said it was rather important. He would like to know whether they formed a favourable or unfavourable opinion of the proposals then made.

Mr. Rudkin said they had not considered them with a view to express an opinion.

The Home Secretary: But you are probably aware that there are certain agreements provisionally entered into, which may or may not be determined, between the Water Companies and other parties—in point of fact, the Government, as it was then represented. With reference to the purchase of the undertakings, do I understand from you that you have never formed an opinion either adverse or favourable to this Bill?

Mr. Rudkin: We have not met for the purpose, owing to the fact that we understood the Bill was withdrawn, or would not be proceeded with.

The Home Secretary: The course which the Government will take will depend upon the views of persons and bodies like yourselves who represent the ratepayers and the public at large. It would be of very great assistance to us if we knew your opinion upon the water question. It has been very largely debated and very strongly expressed on one side and the other, and it would be a great assistance to Mr. Dodson and myself, in considering this matter, if we could have had the advantage of your opinion on the subject.

Mr. Rudkin: Must Parliament adopt the terms of purchase as they stand, or simply reject them? Can Parliament deal with them—can there be any modification by Parliament of the terms?

The Home Secretary said there could not without the consent of those concerned. Parliament, of course, had great power in reserve, and if the terms were found entirely unreasonable it might be assumed that Parliament would not accept them. Probably Parliament would find some method of getting terms that were reasonable; but the first thing he might draw their attention to would be that they should examine these matters, and form their own opinion upon them—whether they wished or did not wish to entertain them. If they made up their mind to examine them, the next point was the question of the constitution of the Trust. If they assumed for a moment that the terms had been settled satisfactorily in some form or other, then the question was as to the body that was to administer the water supply. As far as he could see, the question resolved itself into this—there was the City, there was the Metropolitan Board of Works, and there was a considerable number of districts outside, and in one form or another the interest of these bodies would have to be considered. This was in itself a very complicated question. They might ultimately desire to purchase the undertakings of the Water Companies, and instead of making any bargain or agreement with them, they might go to arbitration. The question was whether they considered that they would do better by that form of proceeding than under the form of proceeding which had been adopted. But really the responsibility seemed to him to rest entirely with the parties who were principally interested. There were these agreements; they would have to take them or leave them as they pleased; and if they left them, they would have to consider whether they would be better off or worse off. These seemed to him to be the elements of consideration, and he could give them no definite answer as to the course the Government were going to take, because the Government, coming fresh to the question, had to collect from all sources their information as to what would be the most advantageous course for them to take, and one consistent with justice to the Companies. It was only from gentlemen like those present that they could derive the necessary information as to the feeling of the public upon these matters. The Government wanted to know, first of all, whether they thought it to be of great importance that the water-works should be bought; secondly, whether they thought the terms which had been offered were fair or unfair terms; and, thirdly, whether they approved of the proposed constitution of the Trust. These were matters on which they could assist the Government more than the Government could assist them.

Mr. Rudkin asked whether, assuming that no action should be taken during the present session with a view to purchase, or of any public body taking the control of the water supply, any action would be taken to prevent an increase of rates in consequence of the increased rateable value under the new assessment.

The Home Secretary said that there again he should like some practical information. The Companies, as he understood the matter, legally had the right to charge on the value of the houses, but he should like to know what their actual practice was. Supposing a house at £100 a year were charged £2 for water; if the rent was raised to £150, would the Companies charge £3? He had heard very opposite statements with reference to this point.

Mr. Shaw said, according to his experience, that was not the case.

Mr. Rudkin said he thought they should be able to give information upon inquiry.

The Home Secretary said he rather asked them for information, for being, as he need not tell them, new to the position, he came fresh to the question, and he wished to deal with it impartially, and wished neither

to adopt nor to condemn any scheme. He wished to have information from those capable of forming an opinion as to the principal evidence on this complicated question.

Mr. Rudkin said they would take care that the Commissioners should attend to the request.

The deputation then withdrew.

The Society of Arts Conference Abandoned.—As we announced last week, the Council of the Society of Arts had under consideration the question of holding a public conference on the subject of the London Water Supply, and appointed a Committee to consider and report thereon. This Committee having met several times, and given full attention to the expediency of the Society holding such a conference at the present time, and having confidence that the subject will be fully considered by Her Majesty's Government at an early period, reported that they were of opinion that no conference should now be held. The Council have accordingly resolved not to take any further steps in the matter.

The Registrar-General publishes the following table in reference to the water supply of London during April. According to the returns furnished to him by the Metropolitan Water Companies, 135,710,884 gallons, or 616,597 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 234 gallons (106·3 decalitres), rather more than a *ton* by weight, to each house, and 32·9 gallons (14·9 decalitres) to each person, against 32·3 gallons during April, 1879.

Companies.	Number of Houses, &c., supplied in Apl. 1879.	Number of Houses, &c., supplied in Apl. 1880.	Aver. Daily Supply of Water in Gallons* during April, 1879.	Aver. Daily Supply of Water in Gallons* during April, 1880.
Total supply	559,464	581,017	128,493,479	135,710,884
From Thames	265,071	278,690	65,170,526	69,665,251
„ Lea and other Sources	294,393	302,327	63,322,953	66,045,633
Thames.				
Chelsea	29,700	30,071	7,912,300	8,530,100
West Middlesex	51,920	54,062	10,176,801	10,882,759
Southwark and Vauxhall	82,965	89,499	23,369,642	23,098,920
Grand Junction	39,648	41,352	11,054,883	12,376,272
Lambeth	60,838	63,706	12,656,900	14,777,200
Lea and other Sources.				
New River	128,024	130,121	26,831,000	26,808,000
East London	118,910	122,746	28,795,000	30,989,900
Kent	47,459	49,460	7,696,953	8,247,733

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for April, 1880, as compared with that for the corresponding month of 1879, shows an increase of 21,553 houses, and of 7,217,405 gallons of water supplied daily.

The following is Dr. Frankland's report on his analyses of the water supplied to London during April:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Tottenham, 1·4; Colne Valley, 1·4; Kent, 1·7; West Middlesex, 3·3; Chelsea, 3·5; Grand Junction, 3·7; New River, 4·3; East London, 4·5; Lambeth, 6·5; Southwark, 6·5. The Thames water supplied by the West Middlesex, Chelsea, and Grand Junction Companies was of fairly good quality, but that of the last-named Company was turbid, and contained moving organisms. The Southwark and Lambeth Companies sent out water of very objectionable quality, containing a very large proportion of organic matter. The Lambeth Company's water was also inefficiently filtered. The Lea water, delivered by the New River and East London Companies, was inferior to the better samples of Thames water, but was efficiently filtered before delivery. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for dietetic purposes, and that sent out by the Colne Valley Company was suitable for all domestic purposes, having been softened before delivery. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; Chelsea, West Middlesex, New River, and East London, clear, pale yellow; Southwark, clear, yellow; Lambeth, slightly turbid, yellow; Grand Junction, turbid, pale yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	25·72	·169	·036	0	·169	·205	1·5	19·5
West Middlesex	26·26	·152	·045	·004	·182	·230	1·5	19·8
Southwark	28·72	·342	·044	0	·196	·240	1·5	20·6
Grand Junction	26·80	·169	·048	·003	·196	·247	1·5	19·1
Lambeth	29·30	·332	·054	0	·198	·252	1·5	19·1
Lea—								
New River	27·20	·211	·044	0	·207	·251	1·5	19·4
East London	29·98	·225	·046	0	·214	·260	1·8	20·3
Deep wells—Kent	42·32	·093	·011	0	·469	·480	2·5	26·0
Outer Circle.								
Colne Valley	11·84	·066	·015	0	·343	·360	1·5	3·7
Tottenham Local Board	40·06	·068	·013	·084	·034	·116	2·8	20·8
Corporation of Birmingham*	28·68	·120	·057	·004	·209	·269	1·7	14·2
Corporation of Glasgow†	2·88	·137	·018	0	·006	·024	·61	·95

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

Burnley Corporation Water Supply and Sewerage Works.—At the last meeting of the Burnley Town Council, the Town Clerk reported that the Local Government Board had issued their Order sanctioning the application of the Council to ultimately borrow a sum not exceeding £80,000 for the extension of their water-works, £14,000 for sewerage works, and £7000 for permanent works, which they had no power to borrow under their local Act.

THE FORTHCOMING EXHIBITION OF GAS APPARATUS, Etc., AT GLASGOW.

Following up the brief notice which appeared in our issue a fortnight ago upon this subject, we have now to say that the movement has been so well launched that there is every probability that it will eventually result in a degree of success that has not yet been equalled in any other town in the kingdom. The Council of the Philosophical Society of Glasgow, by whom the initiative was taken, have the uncontrolled use of the fund resulting from an Exhibition of Science, Arts, and Industry held in the winter of 1846–47, and which, amounting to nearly £1200, is to be made available as a guarantee-fund. Being assured of the use of this fund, they at once appointed a General Committee, consisting of upwards of one hundred gentlemen who might be considered likely to take an active interest in the movement, and amongst whom, we are glad to say, there are included Mr. Foulis and the Managers of the district stations of the Glasgow Gas-Works, as also the Managers of the Gas-Works at Greenock, Paisley, Maryhill, Port Glasgow, Dumbarton, and Coatbridge. A meeting of the members of this Committee was held on Tuesday of last week, presided over by Dr. Fergus, President of the Philosophical Society, who stated briefly what it was proposed to embrace in the exhibition, remarking that the Council had thought that while its main feature should be a collection of a very complete character to illustrate everything connected with the manufacture and use of gas in the fullest sense of those terms, there should also be exhibited apparatus to illustrate other more or less cognate subjects; and in exemplification of his remarks he quoted the list of subjects mentioned in our issue of the 4th inst. He expected that the exhibition would be very popular and useful, and that there would be no loss, and consequently no call upon the guarantee-fund. The promoters of the scheme had been met in a very kindly and cordial manner by the Town Council, and the Gas Committee of the Corporation had also agreed to supply them with gas gratis; for all which they felt deeply indebted, as it gave them encouragement to hope the exhibition would be successful, and that it would interest the public as well.

Dr. William Wallace then submitted a motion for the election of an Executive Committee, with Dr. Fergus as Chairman, Mr. William Foulis and Dr. Wallace as Vice-Chairmen, and Mr. John Mann, C.A., as Secretary and Treasurer. This was seconded by Dr. Henry Muirhead, Vice-President of the Philosophical Society; but before it was voted on, the question arose as to the propriety of persons who were likely to be exhibitors being placed on the Committee. Some discussion took place upon it, the chief speakers being Mr. D. M. Nelson and Mr. P. Watt, both of whom thought that the practical experience of such persons might be of much use to the Committee, but that in the event of awards of any kind being given they should have no voice in any of the classes in which they were themselves exhibitors. Eventually the question was decided in favour of not appointing any prospective exhibitors to act on the Committee, and the motion as proposed by Dr. Wallace was carried.

Subsequently there was some discussion on the question of awards of merit, in the course of which it was mentioned that such awards had been given in connection with several gas apparatus exhibitions in England; and a general recommendation was arrived at in favour of awards—whether medals or certificates, or both, to be afterwards resolved upon. Several members of the Committee also spoke on the question of the best place for holding the exhibition; but the decision on this point was left with the Executive Committee.

A well-attended meeting of the Executive Committee was held last Friday, Dr. Fergus again presiding. Mr. Mann (the Secretary) reported that he had collected a great deal of information, which he was ready to place at the service of the Committee, regarding exhibitions of a more or less similar sort held in other towns. Business was at once entered upon. After some discussion as to the most suitable time for holding the exhibition, it was resolved to prepare for opening it on Tuesday, the 28th of September, and that it should remain open for four weeks. Various other subjects were considered at some length, and two Sub-Committees were appointed to proceed with matters remitted to them, the first and most important being the selection of a suitable building, or a vacant space on which to erect a temporary building of the necessary capacity, and with the desired conveniences. We understand that a very full prospectus will soon be prepared for issue, so as to guide intending exhibitors in proceeding to make their arrangements.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The better classes of round coal for house-fire purposes are still very bad to sell, and the inferior descriptions for iron-making and steam purposes are quite a drug. For house-fire coals the prices at the pit mouth range from 7s. 6d. to 8s. for best, and 6s. to 6s. 6d. for seconds, with common round coals quoted at from 5s. to 5s. 6d. per ton, but there is a good deal of very low selling to secure orders. For gas-making coals there is an increasing number of inquiries in the market, but as consumers in a great many cases are already covered, so far as next season's requirements are concerned, the majority of these are for deliveries over the next couple of years. Although sellers in some cases decline to quote for more than one year, there does not seem to be much difficulty in getting tenders for extended deliveries, and here and there sellers are to be found willing to contract over three years. For cannel, prices seem to be generally maintained at the figures ruling last summer, but ordinary gas coals are offered at very low prices, owing to the abundance of round coal generally in the market; 5s. 9d. to 6s. per ton for unscreened, and 7s. for good screened gas coal at the pit being, as I mentioned last week, above an average figure. Engine classes of fuel still move off steadily at late prices, good burgy fetching about 4s. to 4s. 6d., and good slack 3s. 6d. to 4s. per ton at the pit mouth; but there is less pressure for supplies, and a continuance of the strike in the cotton trade would inevitably tend to throw a good deal of burgy and slack upon the market.

The shipping trade is extremely quiet, and the reports from Liverpool are that there is an almost entire absence of inquiry in the market, whilst the prices quoted to secure orders are exceedingly low; Lancashire steam coal delivered at the High Level being offered at 6s. 3d. to 6s. 6d. per ton.

The iron trade is in a very depressed condition, with scarcely any inquiry in the market for actual consumption. Lancashire makers of pig iron who do not seem inclined to go below 52s. 6d., less 2½ for delivery into the Manchester district, are selling little or nothing, and stocks are accumulating. In the finished iron trade very few new orders are being given out, and although many of the makers are still tolerably well sold, they cannot get in specifications. Bars delivered into the Manchester district are offered at £6 17s. 6d. to £7, and puddled bars at about £4 per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The increased state of activity which has been noticeable in the coal trade of this district since the opening of the year, has within the last few weeks greatly subsided, and though the output is still large, the demand is not nearly so great. The attributable cause is found in the fact that the iron trade, which at the commencement of the year was

brisk, is now somewhat depressed and sluggish. During the last week, however, a slight improvement has been reported, and there is a more decided and hopeful aspect apparent. A decline in the quotations has been looked for all round, but it is now considered doubtful that it will take place just at present, and the quantity being consumed by the blast furnaces is still great. House coal is in fair request, particularly best qualities, and in the neighbourhood of Cannock Chase all the collieries are producing large quantities for immediate shipment. For gas coal there is a good inquiry, and business in this branch is looking as well as it has done at any time of late. Several good contracts are open to the market, amongst them being the requirements of the Shrewsbury Gas-light Company for the next three years supply, and which enumerate some 24,000 tons. The export trade is less brisk, and stocks are slowly increasing. In the whole of the South Staffordshire district there is a feeling of discontent amongst the miners, and notice to rescind the sliding scale has been given. Coke is in fair request, and is being delivered in the district at about the following prices:—South Wales, 20s. to 21s. 6d.; Durham, 20s. to 23s. 6d.; Derbyshire, 18s. 6d. to 22s.

The iron trade shows anything but a satisfactory condition at the present time. There are in this district about 50 furnaces in blast, as compared with 67 a month ago. During last week or nine days as many as ten furnaces have either been damped down or put out, and it is stated that within the next fortnight a dozen or fifteen more will be added to the list, unless a better outlook presents itself on the expiration of the holidays. Several makers are either damping down or putting out for the purpose of repairs, and in the hope that a reaction will set in. The influx of orders from America which were booked to makers in this locality at the beginning of the year have, for the most part, been executed, and though a few yet remain to be completed, they are not of such a character as will occupy smelters for any considerable time. There has, too, been but a limited inquiry for the American market for the last six weeks, and opinion is divided as to the probability of any great demand originating from that quarter for some time to come. Stocks of pig iron are again accumulating, and though best marked bars still maintain their quotations as fixed at quarter-day, yet in all other sorts there is a material reduction. Unbranded bars, in fact, are being offered at exceedingly low rates. Hoops and bars are most inquired after; the former realizing £8 to £8 15s., and the latter £9 to £9 10s. The last week's market showed a little more firmness for both hoops and bars than was reported in the preceding week. Most of the heavy ironfounders are doing a fair trade at present. Angles, tees, girders, and most other kinds of bridge ironwork, are being made extensively in the district. The trade, however, in these branches is chiefly confined to colonial requirements and Government contracts.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The most important feature in connection with the coal trade of this district is the pending contracts for gas and steam coal for forward supplies. The trade in almost all departments is in a wretched state, and some of the largest collieries in the county are only making three and four days per week. As was intimated in my last notice, it was understood that the tenders sent in for gas and steam coal, at least by the South Yorkshire proprietors, would be in advance of those of the last half year. It is stated that tenders have been placed during the week for gas coal at rates as low as, if not lower, than those at which the existing contracts are being supplied. A large colliery firm working the Silkstone and Flockton seams near Barnsley, who were successful last year, tendered at the same price for gas coal, but were cut out by another district colliery. Prices of house coal are low, and at present they seem likely to continue so. The demand for London and the south is not large, and, as an evidence of the mischievous action of the high tonnage rates, it may be stated that whilst in the month of April there was a larger tonnage of coal sent from the inland districts to the Metropolis, there was a marked falling off in both Silkstones and the Barnsley thick seam coal. Nine of the largest pits working the former seam sent 16,200 tons by the Great Northern line during the month of March, but in April the same collieries only supplied 10,800 tons by the same route.

The steam coal trade is looking up, a larger tonnage being forwarded from the southern part of the coal-field to Hull and Grimsby for exportation. The West Riding coalowners are doing a good business with Goole and Hull, the former port being a very advantageous one for the distant collieries. Prices during the past fortnight have not varied a great deal, and, although future contracts are looked upon as likely to be placed at higher rates, this is exceedingly doubtful, as the output is much in excess of the demand, whilst the production is far lower than it need be.

The coke trade is still active, considering the vast output which is going on daily. In addition to the new ovens noticed last week, there are a large number contracted for. The Barrow Hematite Steel and Iron Company have erected a long range at their new colliery at Worsborough, where they intend erecting 120 ovens. Contracts for excavations and the erection of 61 new ovens at the Carton Wood Colliery have been signed, and it is said will cost between £5000 and £6000.

There is very little change to note with respect to the finished iron and steel trade of Yorkshire. There is a fair demand for heavy castings for gas and water purposes, but as a rule the local foundries, which are chiefly dependent upon colliery work, are not so well off. The make of pig iron is fully an average one, there being as yet no falling off in the output, although slight stocks are here and there accumulating.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the counties of Durham and Northumberland continues to be in a dull and, at the steam collieries, something approaching a depressed state. The demand is very moderate. The pitmen of Durham had a proposal submitted to them to restrict the outputs, but they outvoted the proposition. It is pretty certain, however, that the production at the collieries is likely to be in excess of the consumption this summer. Under these circumstances, prices continue to be depressed. Steam coals were lower in price last week than they were in April.

The shipments of gas coals oversea have reached the usual average. The demand for steam tonnage to load gas coals for Cronstadt and the Russian ports was pretty active last week. A number of steamers were engaged to load this class of coals thence. Contractors have been much disappointed that they have been unable to procure steamers to load gas coals at a less sum than 7s. 1½d. for Cronstadt. This is owing to the impossibility of getting profitable cargoes home. There is an improvement to note in the shipments of gas coals to the Italian ports; but the largest quantities sent away by steamers are for London and other ports at home. Coke has sold better for shipping purposes, especially for over sea. The recent fall in prices seems to have attracted customers. The household coal trade, which was bad all the winter, has fallen into the usual summer business; but it is exceptionally quiet and dull. May, with the first opening of the great ports in the Upper Baltic, is, as a rule, an exceptionally busy month in the steam coal trade; but this year shows an extremely bad business, with prices falling rather than improving. The local demand for manufacturing coals is good, but not excessively so.

The coal ports are well supplied with tonnage for coasting purposes. In fact, sailing ships keep in excess of the requirements of shippers, however few arrive. Under these conditions, the freight quotations to London, the East Coast, and the English Channel, register a low level. Steamers were engaged last week to load coals for London at 3s. 10½d. per ton, and sailing ships at 4s. 7½d. Sailing vessels were chartered to load for Poole at 5s. 6d. and 6s.; Dublin, 6s. 6d.; Newhaven and Cowes, 5s. 9d.; Littlehampton, 6s.; and the ports in the North of France in proportion.

The Newcastle chemical market does not show any signs of revival. Business was very disappointing last week. Prices fell. Outside the operations of "bears," the demand for chemicals for shipment was much less than an average. Very few orders come forward. Generally speaking, the tone of this trade, from whatever cause or complexity of circumstances, has disappointed all the hopes of an improvement which were so much indulged in in the early period of the year. They led to a good deal of speculative buying, and heavy losses have been incurred by those who adventured upon it. The shipments of fire-bricks and fire-clay goods last week were fully up to those of April. The manufactured iron trade is unchanged. The shipments of gas, water, and sanitary pipes are upon a moderate scale. Lead is lower in price. The wood merchants have endeavoured in the spring to adjust the imports to the demand; but, though the price of timber is pretty steady, they have failed to secure much of an advance.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Good news was communicated to the Police Commissioners of Stirling at a statutory meeting held on Monday, the 10th inst., and through that body to the gas consumers of the town generally. It was embodied in a letter from the Gas Company, which stated that the Directors had resolved to reduce the price of gas from 4s. 2d. to 3s. 11d. per 1000 cubic feet, and that a reduction of 3s. per lamp per annum would be made in the charge for supplying the public lamps. On the motion of Mr. Thomson, the Commissioners did a very creditable thing, which was to award a vote of thanks to the Directors. It was stated that the reductions announced would amount to £440 per annum on the burgh and the hospitals under municipal authority. This is important to a town like Stirling.

The Perth Corporation Gas Commissioners, at a meeting held last week, resolved, on the solicitation of their Manager, Mr. Whimster, to provide a new exhauster for the gas-works, at an estimated cost of about £200.

I regret to say that the movement for putting the old and new towns of Markinch, Fifeshire, under the provisions of the General Police and Improvement (Scotland) Act, 1862, has been frustrated, in consequence of which the question of the statutory powers for the public lighting of the streets must remain in abeyance for at least twelve months. There was a large majority in favour of remaining "as you were."

In moving the adoption of the Gas Committee's minutes at last week's meeting of the Town Council of Rothesay, Bailie M'Millan, the Convener, stated that in accordance with a remit from a preceding meeting, a thorough inspection of the gas-works had been made, and it was considered by the Manager that, by the addition of a small engine, the present works would be quite sufficient to meet the wants of the community for many years to come. It was, therefore, suggested that a Committee be appointed to see other works where such engines were in use.

On Wednesday last the Shareholders of the Aberfeldy Gaslight Company held their annual meeting, at which a dividend of 5 per cent. was declared, and a gas-rate of 7s. 4d. per 1000 feet was fixed, being the same as that of the past year.

One of the novelties on board the far-famed Clyde saloon passenger steamer *Iona* this season is Muller's gas-making machine. It is not expected that it will be largely called into service during the summer, as the runs of the *Iona* rarely encroach on twilight; but it is thought that it may so far serve the purpose of an experiment as to determine the policy of the system being extended to the deep-sea steamers on Mr. MacBrayne's Highland service.

At a meeting of the Pier and Gas Corporation of Dumbarton, held last Wednesday, Treasurer Brown reported that the deficiency requiring to be made up in the pier funds for the current year was £546. That deficiency was, of course, in terms of a previous resolution, to be made up by the Gas Corporation. It came first from the gas, then went into the "Common Good," and thence to the pier. Provost Babtie, in speaking on the subject, pointed out that if the sum given to the pier had not been required, the charge for gas could have been reduced by 9d. per 1000 cubic feet; so that as the present price is 4s. 7d. per 1000 feet, it might have become reduced to 3s. 10d. at this time but for the circumstance just mentioned. It should be borne in mind also that the meters used by the consumers are given free of charge.

Business was done in the shares of the Edinburgh and Leith Gas Company on Monday week; at £30 per share.

The Town Council of Falkirk held a meeting last Thursday, when the Clerk submitted and read a letter from the Falkirk Lighting Company, answering the Town Clerk's letter of the 14th ult., from which it appeared that the Manager (Mr. Scott) had been instructed to intimate that the Company would be quite prepared to pay one-half of the expense of any properly qualified gas analyst from either Edinburgh or Glasgow; and, further, rather than see the ratepayers put to any expense, as far as testing went, the Company would be glad to place their gas-testing apparatus at the disposal of such analyst, on the understanding that the periodical testing of their gas be published in the *Falkirk Herald*. Mr. Coutts moved that the letter be allowed to lie on the table for a month, and this was unanimously agreed to, the meeting expressing its satisfaction with the terms of the communication.

The past week's pig iron market was comparatively steady, and the fluctuations in price were within much narrower limits. There is still a desire to invest in pig iron. The closing prices on Friday were 46s. 3d. cash and 46s. 4½d. one month for buyers, and sellers very near.

No new features have presented themselves in the coal market. Business keeps dull, and orders for all descriptions are scarce.

SALE OF SHARES IN THE CHATHAM AND ROCHESTER WATER-WORKS COMPANY.—On Monday last week there were offered for sale by auction 42 shares in the above-named Company. The prices realized were as follows:—25 at £10 16s. each, 14 at £10 17s., and 3 at £10 18s. The total amount of the sale was £454 12s.

THE PARIS GAS COMPANY'S NEW WORKS AT CLICHY.—In the report presented by the Board of Direction of the Paris Gas Company at the annual general meeting of the Shareholders on the 25th of March, a translation of which appeared in the JOURNAL of the 27th ult., reference was made to the necessity under which the Company found themselves, in consequence of the increased demand made upon them for gas, to commence the construction of entirely new works at Clichy. At the time the report was prepared considerable progress had, we believe, been made with the work; but we now learn, from our contemporary *Le Gaz*, that the gasholder-tanks are already finished, and that most of the working

plant is in course of erection. The works have been planned for a daily production of 500,000 cubic mètres, or about 18 million cubic feet of gas; and it is believed they will be ready to commence operations in the course of October next. The mere fact that works of such magnitude as this are urgently called for to meet the ever-growing requirements of the gas supply in Paris, is a striking proof, if any were needed, that the more extended employment of this well-tried and reliable source of light is in no way interfered with by the ephemeral popularity of more dazzling though less trustworthy illuminants.

Bideford Gas and Coke Company, Limited.—The annual meeting of this Company was held last Wednesday, when the Secretary (Mr. James Jose) read the notice of meeting, after which the Directors report was adopted. This stated that during the year ending March 31 the Directors had effected several improvements and extensions of the works of the Company. A capacious building had been erected in which had been placed a set of four new purifiers, a station-meter, and a governor, the need of which had for some time past been experienced. The total outlay on new works and extensions had been £1300. Of this amount there had been received for calls on the new shares £832; the balance of capital account was £137 14s. 6d.; and the balance—viz., £330 5s. 6d.—was paid out of the current account. The balance-sheet showed the amount at disposal to be £1085 16s., exclusive of £330 5s. 6d. paid on capital account. A dividend at the rate of 10 per cent., which the Directors recommended, amounted to £557, leaving a balance of £528 16s. to be carried forward. The reserve-fund amounted to £304 10s. 9d., and this the Directors recommended should be increased to £350. The capital of the Company consists of 615 £10 shares fully paid, while there are 85 shares still to issue. The receipts for the twelve months from gas and meter rental amounted to £2165 13s. 3d.; from residuals, to £368 4s. 1d.; and from fitting and labour accounts, to £134 16s. 1d. Miscellaneous receipts brought the total to £2682 7s. 1d., of which the expenses absorbed £1990 14s. 7d., leaving £691 12s. 6d. as the balance of revenue account.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

967.—Clift, S., Conway, North Wales, "Improvements in the manufacture of certain coal-tar products. March 5, 1880."

1876.—Sampson, J. L., London, "Improvements in or connected with apparatus for lighting or illuminating with gas." May 7, 1880.

1886.—Hickman, H. T., Stourbridge, Worcester, "A new or improved composition for the manufacture of fire bricks and blocks, gas-retorts, and other articles in which great infusibility is required." May 8, 1880.

1895.—Howat, A., Manchester, "An improved method of and apparatus for holding glasses, globes, or shades for gas and other lights." May 8, 1880.

1901.—Dann, J. T., Brixton, London, "Improvements in the construction of apparatus for lighting and extinguishing gas-burners by automatic means." A communication. May 10, 1880.

1933.—Preston, F. P., Prestige, J. T., and Preston, E. J., Deptford, Kent, "Improvements in apparatus for regulating and controlling the flow of water and other liquids, and preventing waste of same." May 11, 1880.

1959.—Hardman, J., Manchester, "Improvements in the production of anthracene from gas tar." May 13, 1880.

1969.—Haigh, W. B., and Nuttall, J., Oldham, Lancs, "Improvements in gas-engines." May 13, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4704.—Livesey, G. T., Old Kent Road, London, "Improvements in apparatus used in the manufacture of gas." Nov. 19, 1879.

5051.—Clark, A. M., Chancery Lane, London, "Improvements in apparatus used in the manufacture of gas." A communication. Dec. 10, 1877.

5239.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in valves for steam, gas, and air engines." A communication. Dec. 22, 1879.

117.—Robinson, H., Manchester, "Improvements in gas motor engines." Jan. 10, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1632.—Weatherhogg, G. W., "Improvements in apparatus for carburetting atmospheric air." April 26, 1877.

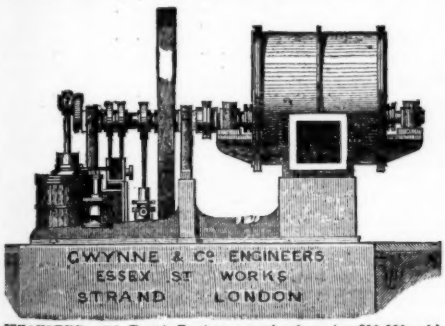
1644.—Cutler, S., "Improvements in apparatus used in the purification of gas." April 27, 1877.

1769.—Hearson, C. E., "Improvements in lamps and lamp-burners." May 7, 1880.

1774.—Burbidge, T., "Improvements in valves for regulating or controlling the supply and discharge of water or other fluids." May 7, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

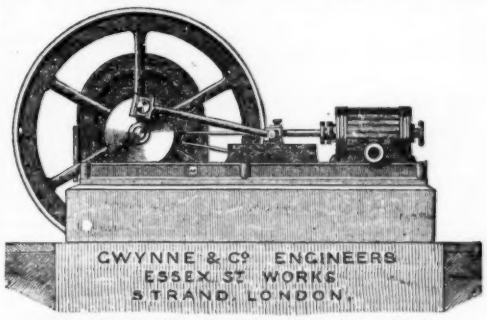
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

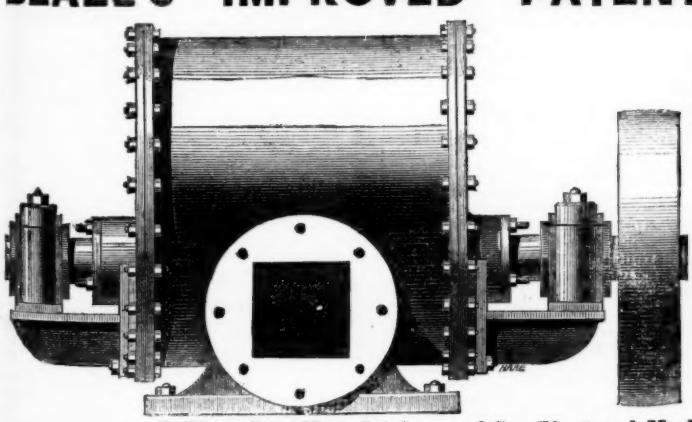
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH OR WITHOUT

WROUGHT-IRON SPINDLES AND

ENGINES COMBINED.

GEORGE WALLER & CO.,

MAKERS OF

ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, by the Advertiser, a Situation as MANAGER or ASSISTANT MANAGER. Is thoroughly well up in the Manufacture and Distribution of Gas. Aged 24. Salary £100 per annum. Address No. 660, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES AND OWNERS OF GAS-WORKS.

THE Advertiser offers his Services as MANAGER or Manager and Secretary of small, or Assistant in large Works. Having had several years experience (two years as Manager of a Works making 20 millions), is well acquainted with every detail of Manufacture, Office Work, &c. Unexceptionable references as to character and ability. Address No. 656, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Good Foreman Bricklayer who has been used to the Building of Large Gas-holder-Tanks. Must be thoroughly sober and trustworthy. Apply with references, and stating wages required, to No. 661, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TODMORDEN GAS COMPANY.

WANTED, an Energetic Man as Collector and Meter Inspector. Salary £65 per annum. Security required. Address, on or before the 27th inst., in own handwriting, stating age, qualifications, &c., to HENRY A. COLES, Manager. Gas-Works, Todmorden, May 14, 1880.

GAS-WORKS Manager required for a small foreign concern, ten days' distant. Salary £225; progressive on results. Forward full particulars prepaid. WILLIAM BLEWS AND SONS, Gas Engineers, BIRMINGHAM.

METER TAKER, COLLECTOR, &c.

THE Directors of the Watford Gas and Coke Company are prepared to receive APPLICATIONS for the Situation of METER TAKER, Collector, Assistant in Keeping the Rental Books, and to receive Complaints, &c. The Company provide house, coals, and gas, and will require security to be given for an amount to be agreed upon. Candidates are requested to forward written applications, stating amount of salary required, and accompanied with testimonials, addressed to me at the Office of the Company, 5, Derby Road, Watford, not later than May 28, 1880. WILLIAM ROWELL, Secretary.

WANTED, to Lease a small Gas-Works, by a Practical Gas Engineer. Address No. 654, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Second-hand Square STATION-METER, to pass 40,000 cubic feet per hour. Erected about 12 years. Made by Messrs. J. and J. Braddock, Oldham. Now in use at the Plymouth Gas-Works. To be removed to make place for a larger sized Meter. To be sold a bargain. For price and particulars apply to W. W. ANDREWS, 238, Kingsland Road, LONDON.

A BARGAIN.

FOR IMMEDIATE SALE—A Round STATION-METER, capable of passing 2500 cubic feet per hour (clock in centre), ¾-in. Bends, and one 5-in. Four-way Valve, which have been taken down to make room for a larger one. Apply to Mr. W. C. DAWSON, Gas-Works, ARUNDEL.

EXHAUSTER FOR SALE.

THE Malton Gas Company have for Disposal an EXHAUSTER and ENGINE, erected by Messrs. Dempster in 1873, capable of passing 7000 cubic feet per hour. It may be seen in operation, and further particulars obtained on application to the undersigned. HENRY TOBEY, Secretary.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

- 54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
- 16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
- 4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
- 320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
- 160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
- 215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
- 50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
- 60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
- 37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
- 40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
- 17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
- 481 Lengths 4-in. Cast-Iron H-Pipes.
- 506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection. The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield. Applications to be addressed to the undersigned. THOS. ROBERTS, Manager. Gas Office, Sheffield, March 25, 1880.

TAR FOR SALE.

THE Directors of the Dronfield Gaslight and Coke Company are open to receive TENDERS for the Purchase of the Surplus TAR produced at their Works for Six months from July 1, 1880. Tenders, stating price per ton at the Works, or delivered in casks at Dronfield Railway Station, to be sent to the undersigned not later than the 31st inst. The Directors do not bind themselves to accept the highest or any tender. C. THORPE, Secretary. Chesterfield, May 6, 1880.

THE Broadstairs Gas Company have for SALE—

- One 6-in. Station Governor.
- Two 7 ft. 6 in. Lengths of 15-in. Round Hydraulic Main.
- One 15-in. Round Mouthpiece.
- Fifteen 14-in. Round Mouthpieces.
- Fifteen 4-in. Ascension-Pipes.
- Fifteen 4-in. H-Pipes.
- Fifteen 4-in. Dip-Pipes.
- Nineteen Round Retort-Lids.
- Fifteen Retort Screws.

All in good condition. Removed to make room for larger. For particulars and price, apply to W. J. LATCHFORD, Manager. Gas-Works, Broadstairs, April 27, 1880.

GAS PLANT FOR SALE.

THE Coventry Gas Company have for SALE—

SCRUBBERS.—One 5 ft. 6 in. diameter, 15 ft. high. One 5 ft. diameter, 20 ft. high; with or without 8-in. Connections and Valves.

GASHOLDER.—One Telescopic, 40 ft. diameter and 34 ft. high, in two lifts; Cast-iron Tank for same, 41 ft. 6 in. diameter, 18 ft. high.

STEAM-JET VENTILATOR.—One No. 2 Körting's Patent Jet Ventilator, with Chest. One No. 3½ Körting's Patent Jet Blower.

VALVE.—One 12-in. Cathels's Four-way Valve.

The above are being replaced by larger apparatus, and can be removed at once. Also a 100-light Gas Apparatus (Porter's make); this includes a Gasholder, 14 ft. diameter and 10 ft. high, which could be sold separately. For particulars and prices apply to W. L. ROBINSON, Manager. Gas-Works, Coventry, April 17, 1880.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—

SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.

CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.

ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.

STATION-METERS.—One Station-Meter, with Valves and Bye-pass for 20,000 per hour, in ornamental case (Milne); one Station-Meter, with Valves and Bye-pass for 6000 per hour, in cylindrical case.

HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.

BRIDGE AND ASCENSION PIPES.—90 6 in. by 4 in. Bridge-Pipes, and a quantity of 6-in. Ascension-Pipes and Bends.

For further particulars and price apply to JOHN WEST, Engineer and Manager. Gas Works, Maidstone, April 21, 1880.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned. R. MORLAND, Engineer.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in. The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus. The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned. By order, WILLIAM J. MOON, Manager. Scarborough, March 5, 1880.

TO CHEMICAL MANUFACTURERS.

THE Gas-Works Committee of the Keighley Local Board of Health invite TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR produced at their Works from the 1st of July next to June 30, 1881. Particulars and forms of tender can be obtained on application to the undersigned, to whom tenders must be sent not later than Monday, the 24th inst. By order, J. LAYCOCK. Low Bridge, Keighley, May 6, 1880.

TO LIME MERCHANTS.

THE Directors of the Loughborough Gas Company will be glad to receive TENDERS for Supplying good Hand-Picked LIME, for Purifying purposes, for One, Two, or Three years, to be delivered at the Loughborough Railway Station, carriage paid. The quantity used per year is about 180 tons. The Lime must be well burnt and free from stone. The delivery to be from time to time as the Manager shall direct, commencing from the 1st of July. Tenders to be addressed to me, and delivered by the 20th of the present month. J. B. BALL, A.I.C.E., Manager.

TO MANUFACTURING CHEMISTS.

THE Directors of the Loughborough Gas Company invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, from the 1st of July next. The quantity of Tar made per year is about 180 tons, and about 320 tons of Ammonia Water. Both residuals will be delivered into Contractor's boats at the expense of the Company. Terms and conditions of the contract may be obtained of the undersigned. Tenders to be addressed to the Manager, and delivered by the 20th of the present month. J. B. BALL, A.I.C.E., Manager.

COAL TENDER.

THE Directors of the Loughborough Gas Company are prepared to receive TENDERS for One, Two, or Three years for 4000 tons per year, of good, well-screened GAS COALS, to be delivered at the Loughborough Railway Station, or Canal Wharf, which is 300 yards from Works, carriage paid, and forwarded in the following monthly quantities, viz.:—

1880, July	200	tons.
,, August	200	,,
,, September	350	,,
,, October	350	,,
,, November	550	,,
,, December	550	,,
1881, January	550	,,
,, February	450	,,
,, March	350	,,
,, April	150	,,
,, May	150	,,
,, June	150	,,
Total	4000	tons.

The Coal to be entirely free from refuse of every kind. Sealed tenders to be addressed to me, and delivered at the Offices by the 20th of the present month. The Directors do not bind themselves to accept the lowest or any tender. J. B. BALL, A.I.C.E., Manager.

BOROUGH OF BURY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Corporation of Bury are prepared to receive TENDERS for GAS COAL for One, Two, or Three years, commencing on the 1st of June next, to be delivered free at the railway siding at Buckley Wells, or at the Corporation siding Town's Yard, Fernhill, as may be required. Estimated quantity for the first year, 10,000 tons; for the second and third years, 12,000 tons each. Further particulars may be obtained upon application to Mr. Samuel Parsons, Manager, Gas-Works, Elton. Tenders, endorsed "Tender for Gas Coal," stating the colliery from whence the Coal is proposed to be supplied, to be sent to me, the undersigned, on or before Wednesday, the 26th inst. The Committee do not bind themselves to accept the lowest or any tender. By order, FREDERICK BULL, Town Clerk. Corporation Offices, Bury, May 7, 1880.

BOROUGH OF ROTHERHAM GAS-WORKS.

TO GASHOLDER MAKERS.

THE Gas Committee invite Tenders for the entire Resheeting of, and Additions to their 80-ft. GASHOLDER. The additions consist of a new set of Wrought-Iron Brackets for Wheels. Specifications can be seen, and forms of tender obtained, by applying to Mr. Goodwin, Manager, Gas-Works, Rotherham. Tenders, endorsed "Tender for Gasholder Repairs," to be sent in to me on or before the 20th of May inst. The lowest or any tender not necessarily accepted. By order, GEO. W. HODGKINSON, Town Clerk. Council Hall, Rotherham, May 7, 1880.

BOROUGH OF ROTHERHAM GAS-WORKS.

TO BOILER MANUFACTURERS.

THE Gas Committee invite Tenders for the Supply of Two CORNISH BOILERS 20 ft. by 6 ft., each fitted up with two Flues; also four Cross Tubes and Valves, Gauges and Fitting complete. Specification and drawings can be seen, and forms of tender obtained, by applying to Mr. Goodwin, Manager, Gas-Works, Rotherham. Tenders, endorsed "Tender for Boilers," to be sent in to me on or before the 20th day of May inst. The lowest or any tender not necessarily accepted. By order, GEO. W. HODGKINSON, Town Clerk. Council Hall, Rotherham, May 7, 1880.

TO COAL PROPRIETORS.

THE Directors of the Cheltenham Gas-light and Coke Company invite TENDERS for the Supply of the best quality of COAL for making gas, for One, Two, or Three Years, from the 1st of July next.

For quantities, particulars, and conditions of contract, application to be made to the Company's Engineer.

Sealed tenders, addressed to the undersigned, must be forwarded on or before Thursday, the 20th of May.

The Directors do not bind themselves to accept the lowest or any tender.

R. O. PATERSON, Engineer.

Gas-Works, Cheltenham, April 26, 1880.

COAL CONTRACT.

THE Directors of the Newmarket Gas-light Company are prepared to receive TENDERS for the Supply of 2000 Tons of Best Screened GAS COAL, to be delivered as required during the next Twelve months ending May 31, 1881.

Tenders, stating price per ton delivered free at the Great Eastern Railway Station, Newmarket, to be sent on or before Saturday, May 29, 1880, to the undersigned, from whom any further information may be obtained.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS WILKINSON, Manager.

WEST BROMWICH GAS-WORKS.

THE West Bromwich Improvement Commissioners are prepared to receive TENDERS from competent persons for Making and Delivering additional Cast-Iron MAIN-PIPES and APPENDAGES.

Specification may be seen and forms of tender, with quantities, may be obtained on and after Wednesday, May 19, 1880, on application to the undersigned, at the Town Hall, West Bromwich; and sealed tenders on the form supplied, properly endorsed, must be delivered on or before Thursday, the 27th of May inst., at my Offices in the Town Hall, West Bromwich.

The Gas Committee do not bind themselves to accept the lowest or any tender.

CHAS. H. BAYLEY, Clerk.

Town Hall, West Bromwich, May 14, 1880.

EAST GRINSTEAD GAS AND WATER WORKS.

TO GAS ENGINEERS.

CONTRACT No. 6.

THE Directors of the East Grinstead Gas and Water Company are prepared to receive TENDERS for the Construction and Erection of a Single-Lift GASHOLDER, 45 ft. diameter by 20 ft. deep, at their Gas-Works at East Grinstead, in the county of Sussex.

Specifications can be obtained on payment of 10s. 6d. each, and the drawings and particulars can be seen either at this Office, or at the Office of the Engineer, Mr. Edward Easton, C.E., 9, Delahay Street, Westminster, S.W.

Sealed tenders, endorsed "Tender for Gasholder," must be sent in to the Company's Secretary on or before May 26, 1880.

The Directors do not bind themselves to accept the lowest or any tender.

E. A. HEAD, Secretary.

Gas and Water Company's Offices,
East Grinstead.

EAST GRINSTEAD GAS AND WATER WORKS.

TO BUILDERS AND CONTRACTORS.

CONTRACT No. 5.

THE Directors of the East Grinstead Gas and Water Company are prepared to receive TENDERS for the Construction of a Brick GASHOLDER TANK, 48 ft. 6 in. diameter and 20 ft. deep, at their Gas-Works at East Grinstead, in the county of Sussex.

Specifications can be obtained on payment of 10s. 6d. each, and the drawing and particulars can be seen either at this Office or at that of the Engineer, Mr. Edward Easton, C.E., 9, Delahay Street, Westminster, S.W.

Sealed tenders, endorsed "Tender for Gasholder Tank," must be sent in to the Company's Secretary on or before May 26, 1880.

The Directors do not bind themselves to accept the lowest or any tender.

E. A. HEAD, Secretary.

Gas and Water Company's Offices,
East Grinstead.

BRISTOL UNITED GASLIGHT COMPANY.

SPECIFICATION AS TO SUPPLY OF COALS.

THE Directors of the Bristol United Gas-light Company invite TENDERS for the Supply of about 100,000 Tons of GAS COALS, during the Twelve months between July 1, 1880, and July 1, 1881, for use at their Works, situated respectively at Avon Street, St. Philip's, Canons Marsh, and Stapleton Road, Bristol.

In the above-named quantity there is included about 10,000 Tons of Scotch or other Cannels, or other rich Gas Coals from the Northern or Midland Districts.

The Coal to be partly small and partly large or brush, and to be delivered in such monthly proportions as may be required by the Company, and in accordance with the season. The quality of the Coals must be good, dry, and free as possible from sulphur, bats, binds, refuse, and dirt.

Particulars required of the quality of the Coals for which tenders may be submitted; and the Directors will be glad to receive chemical analyses thereof, and any reliable information in relation to their properties for the manufacture of gas that the parties tendering may be able to supply.

Parties tendering must state the maximum quantities of either small, large, or brush Coal they will undertake to deliver monthly, and it must be understood that the Directors are to be at liberty to accept the terms offered for any lesser quantities they may think fit.

Tenders to state the prices per ton f.o.b. (port of shipment to be named), or delivered at Railway Station, Bristol, or at either of the Works of the Company, and the discount for monthly cash payments.

The Stapleton Road Works are adjoining both the Midland and Great Western Railways, from the latter of which the Company have a siding.

Payment will be made monthly for every ton of 20 cwt., as indicated by the weighbridges of the Company at their respective stations.

Sealed tenders to be addressed to the Chairman of Directors, Bristol United Gaslight Company, Canons Marsh, Bristol, marked "Tender for Gas Coal," and delivered not later than Tuesday, the 1st of June next.

HENRY H. TOWNSEND, Secretary.

Gaslight Offices, Bristol, May 7, 1880.

GUILDFORD GASLIGHT AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for the TAR and LIQUOR produced at their Works for the year ending June 30, 1881.

Tenders to be delivered to Mr. LONGWORTH, Gas Offices, GUILDFORD, on or before Tuesday, June 8, and from whom any required particulars may be obtained.

TO COAL PROPRIETORS.

THE Directors of the Preston Gas Com-pany are prepared to receive TENDERS for the Supply of CANNEL and COAL for One, Three, or Five years.

Sealed tenders, endorsed "Tender for Cannel and Coal," must be delivered to the undersigned, on or before Wednesday, the 2nd of June next.

HENRY GREEN, Engineer.

Gas-Works, Preston, May 11, 1880.

TENDERS FOR GAS COAL.

THE Corporation of Walsall invite TENDERS for the Supply of 24,000 tons of Staveley, Yorkshire, or any other good GAS COAL, to be delivered during One year from the 1st of July next, either at the Walsall Railway Station, the Corporation siding at the new Gas-Works, or by boat at Walsall old or new Gas-Works. In the latter case it will also have to be unloaded and stacked in the coal-sheds, or such other places at the Gas-Works as may be directed. The Coal will have to be delivered at the rate of from 100 to 850 tons per week, as the Corporation may from time to time require.

Payments monthly.

The Corporation do not bind themselves to accept any tender, and they reserve the right to divide the contract between several firms.

Tenders, sealed and marked outside, "Tender for Gas Coal," and stating the price for large Coal, and also for Nuts, are to be sent to the undersigned on or before Wednesday, the 2nd of June next.

SAMUEL WILKINSON, Town Clerk.

Bridge Street, Walsall, May 14, 1880.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the whole or a portion of the GAS TAR to be produced at their Gaythorn and Rochdale Road Works during a period of Three or more years, commencing on the 1st day of March, 1881.

Sealed tenders, addressed to the Chairman of the Gas Committee, Town Hall, Manchester, and endorsed "Tender for Gas Tar," must be delivered here on or before Wednesday, the 16th day of June next.

The Committee do not bind themselves to accept the highest or any tender.

Further particulars and forms of tender may be obtained on application to Mr. Geo. B. Jackson, at the Gas Office.

By order,
JOS. HERON, Town Clerk.

Town Hall, Manchester, May 15, 1880.

THE SHREWSBURY GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of the above Company are desirous of receiving TENDERS for the Purchase of the Surplus AMMONIACAL LIQUOR made at their Works during the Three years commencing July 1, 1880.

The estimated quantity for disposal is about 1200 tons per annum, delivered into tanks on the London and North-Western Railway, or into boats on S.U. Canal (the latter preferred) at Shrewsbury.

Payments to be made monthly, net.

Tenders to state a separate price per Ton for Liquor of 5°, 6°, and 7° Twaddel, and to be sent in to the undersigned not later than June 7, 1880.

The Directors do not bind themselves to accept the highest or any tender.

By order,
WM. BELTON, Secretary and Manager.

Gas-Works, Shrewsbury, May 10, 1880.

CITY OF LIMERICK.

TO ENGINEERS.

THE Town Council of Limerick will receive PLANS for the Construction of Works to give, either by gravitation or otherwise, a Continuous Supply of Pure Water (assumed to be One million gallons daily at the least), proper and sufficient for all purposes and requirements—public, domestic, and otherwise—to the City of Limerick and its suburbs. The pressure to be such as will command at all times the highest elevation of all buildings.

An estimate of the expense of constructing the proposed Works to accompany each plan, and the probable time stated within which same can be completed.

The Council will not bind itself to accept or pay for any of the plans.

Plans, &c., under cover and seal, addressed to the "Town Council," to be delivered at the Town Clerk's Office, Town Hall, Limerick, on or before the 15th day of July, 1880.

JOHN ELLARD, Town Clerk.

Town Hall, May 10, 1880.

CORPORATION OF BURTON-ON-TRENT—GAS DEPARTMENT.

THE Committee of the Gas Department are prepared to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR, also the Surplus TAR produced at their Works, *not together but separate*, for One year, delivered into Contractor's railway tank trucks at the Gas-Works siding.

Payments to be made monthly, net cash.

The surplus quantity of Tar is estimated at 600 tons, but the same cannot be guaranteed, as it may be more or less.

Further particulars may be had on application to the undersigned.

Sealed tenders, to be addressed to the Chairman, and endorsed "Tender for Ammoniacal Liquor," "Tender for Tar," to be sent to me not later than the 29th day of May, 1880.

The Committee do not bind themselves to accept the highest or any tender.

JOHN MUDIE, Manager.

Gas-Works, Wetmore Road, May 13, 1880.

THE Strabane Town Commissioners will receive TENDERS for CONDENSER and SCRUBBER, &c., Supplied and Erected complete at their Works.

Tenders will be received not later than the 22nd inst.

The Commissioners do not bind themselves to accept the lowest or any tender.

Plans and Specification can be seen on application to
C. REILLY, Manager.

BANGOR LOCAL BOARD OF HEALTH.

TENDERS FOR GAS COAL.

THE Water and Gas Committee of the above Board invite TENDERS for the Supply of the Best Screened GAS COAL, and also Screened CANNEL, for One, Two, or Three years, commencing the 1st of July next, at the following quantities per annum, viz.:—About 1200 tons of the Coal and about 150 tons of the Cannel, to be delivered (carriage paid) by railway at Bangor Station, and by sea at Hirael, Bangor (freight paid), in such quantities and at such periods as may be required.

Parties tendering must give full particulars as to the quality of the Coal and Cannel offered, and the name of the colliery from which they propose the supply.

Sealed tenders, under cover, endorsed "Tenders for Coal," addressed to the undersigned, will be received until the 5th of June next.

DAVID WHITE, Secretary and Manager.

Water and Gas Works, Bangor, Carnarvonshire,
May 15, 1880.

TO COLLIERY OWNERS, &c.

THE Directors of the Barnsley Gas Com-pany hereby invite TENDERS from parties willing to Contract to Supply and to Deliver into the Retort Houses at their Works, situated at Old Mill and Pontefract Road, Barnsley, respectively, any quantity not exceeding 12,000 tons per annum of Screened Soft COAL or NUTS of the best quality, suitable for Gas-Making, that they may require for a period of One, Two, or Three years, as may be agreed upon, from Oct. 1, 1880. The said Coal to be delivered in a dry condition, free from smudge, dirt, shale, pyrites, or other impurities, at either of the said Works, in such quantities and at such times as the Manager may direct. There are railway sidings into both Works.

Sealed tenders, stating respectively the price of Coal or Nuts delivered as above, endorsed "Tender for Coal," and addressed to the Chairman, must be left at the Gas Company's Office on or before Thursday, the 3rd of June instant.

Any further information required may be obtained on application to the undersigned.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
JOHN HUTCHINSON, Manager.

Gas Offices, Pontefract Road, Barnsley,
May 12, 1880.

MR. FREDK. COLYER, M. Inst. C.E., informs his clients and friends his Offices are now at 18, GREAT GEORGE ST., WESTMINSTER, S.W., where he may be consulted upon any matter relating to Gas or Water Works.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES
OF
KING'S TREATISE

On the Science and Practice of the Manufacture and Distribution of

COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

CAN THE HYDRAULIC MAIN BE ABOLISHED?

YES, very easily, by using

WHITE'S AUTOMATIC GAS-VALVE.

HERE'S PROOF:—

Gas-Works, Aberystwith, Jan. 24, 1880.

Mr. Wm. White, Abersychan, Mon.

Dear Sir,—The retorts fitted with your Valves answer very well. Our average make is 5600 cubic feet per mouthpiece, and we have no difficulty in producing 16-CANDLE GAS WITHOUT ANY CANNEL; although we formerly (with the old hydraulic dip-pipes) used a percentage to obtain that candle power. During the whole time they have been at work we have not been troubled with a choked ascension-pipe.

Yours respectfully,
J. DOUGALL, Engineer.

NOTE.—Other testimony to follow. Illustrated pamphlet descriptive of the system sent post free for 6d. in stamps, on application to the Inventor and Patentee as above.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

W. C. HOLMES & Co.,

ENGINEERS AND CONTRACTORS

FOR

GAS AND WATER-WORKS,

WHITESTONE IRON-WORKS,

HUDDERSFIELD.

REFERENCES TO UPWARDS OF 400 WORKS.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,

BRADFORD, YORKSHIRE.

H. & C. DAVIS & CO.'S

Illustrated Catalogue sent Free.

FAMILY GAS KITCHENERS, HOTEL GAS RANGES, ARTIZANS & COTTAGE GAS COOKERS, BREAKFAST GRILLERS, &c. GAS BATHS, CIRCULATING GAS BOILERS, ASBESTOS FIRES, AND CHEERFUL HEATING STOVES.

286, 288, & 290, CAMBERWELL ROAD, LONDON, S.E.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas*, with 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agent: MR. F. J. LEE SMITH, 38 THROGMORTON ST.

WOOD TROUGHING

For Preserving Service-Pipes.

Price from Three-Farthings per Foot.

In any Lengths.

THOS. PROUD,

Brookfield Works, Icknield St., Birmingham.

GEORGE E. TOURNAY,

CONTRACTOR FOR THE ERECTION AND REBUILDING OF RETORT-BENCHES, CHIMNEY SHAFTS, &c.

RETORT SETTING A SPÉCIALITÉ.

References to large and small Works.

ADDRESS: WINCHEAP, CANTERBURY.

OXIDE OF IRON.

Gas Companies can be supplied with any quantity of Natural Oxide suitable for Gas Purification purposes. Shipped direct from the extensive estates in Co. Donegal of the Earl of Leitrim and Wybrants Olphert, Esq., D.L.

By thus purchasing from the producer a constant supply of the purest material will be ensured to the Gas-Works, and intermediate profits will be saved to the Shareholders.

For terms, references, and particulars apply to

JOHN BEATTIE,

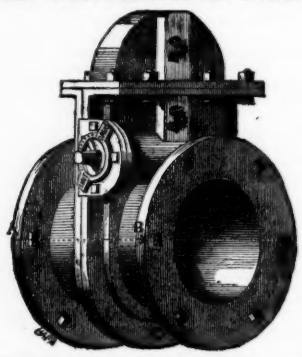
FALCARAGH, Co. DONEGAL, IRELAND.

B. DONKIN & Co.'S

IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.

TRADE MARK



TRADE MARK

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO MAKERS OF

J. BEALE'S NEW PATENT GAS EXHAUSTERS, STEAM-ENGINES for Driving Gas Exhausters,

VALVES FOR AMMONIACAL LIQUOR, TAR, &c., IMPROVED BRIDGE VALVES for Regulating the Seal in Hydraulic Mains, so arranged that when once adjusted for the proper overflow they can be closed entirely and opened again without altering the adjustment,

GAS THROTTLE-VALVES, SPECIAL GAS-VALVES with Columns, Gauges, &c.

BYE-PASS VALVES, SCREW WATER-VALVES, &c., &c.

B. DONKIN & Co., BERMONDSEY, LONDON, S.E.

THE IMPERIAL METER COMPANY, LIMITED,

(FORMERLY ALSO WALTER FORD, AT GRAY'S INN ROAD,)

MANUFACTURERS OF EVERY DESCRIPTION OF WET AND DRY GAS-METER,

KING'S ROAD, ST. PANCRAS, N.W.

Invite the attention of Gas Companies to their

DRY METERS,

As combining Materials of best quality and unusual strength, superior Workmanship, and every improvement.

Made also with seasoned wood outer cases for exposed positions.

The I. M. Co.'s Patent WET METER is known as the simplest Compensating Meter, frictionless, extremely accurate in registration and less liable to derangement, from any cause, than any other Meter hitherto tested by use on a large scale.

SAMUEL CUTLER & SONS,

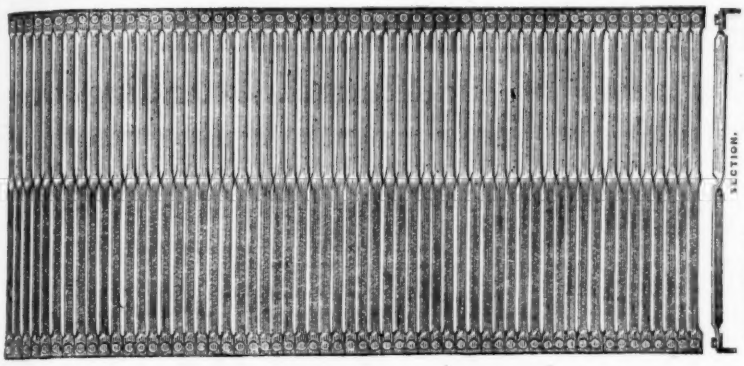
MILLWALL, LONDON, E.,

CONTRACTORS FOR THE

ERECTION OF GAS AND WATER WORKS,

Undertake their ENTIRE ERECTION or EXTENSION in any part of the World, including Small Works for VILLAGES and MANSIONS, as well as of very LARGE EXTENT. Have recently constructed for the PHŒNIX GAS COMPANY the LARGEST GASHOLDER yet erected.

S. C. and SONS supply *every* requisite for Gas-Works, and keep in stock Small Articles, such as BARROWS, SCOOPS, RETORT-LIDS, BOLTS, &c.; and they manufacture WOOD SIEVES of a very superior description.



CUTLER'S PATENT WATER-VALVES
Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.
Full Particulars on Application.

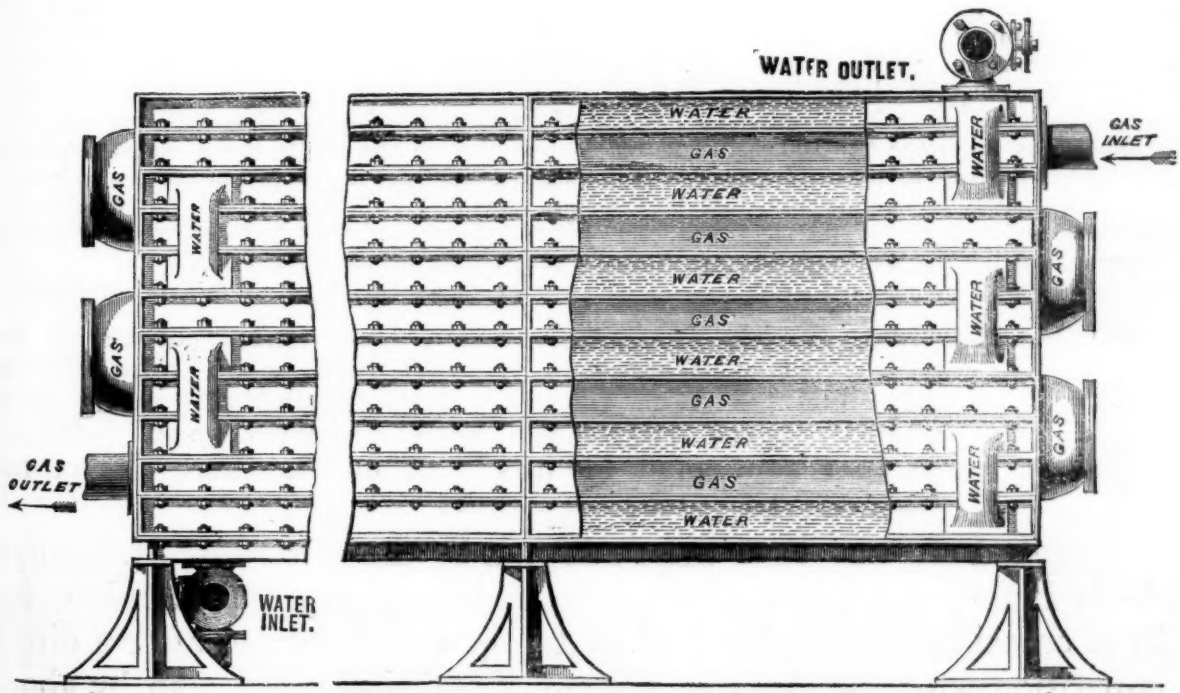
CUTLER'S PATENT SIEVES
Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

Copies of Testimonials on Application.

MORRIS AND CUTLER'S PATENT CONDENSERS

Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Maidstone, Buxton, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



Also CUTLER'S PATENT MOUTHPIECE SUPPORTS,
AND
CUTLER'S PATENT REMOVABLE DIPS.
[*See* JOURNAL for Nov. 25, 1879.]

BRAY'S
PATENT LANTERN AND FLAT-FLAME BURNERS.

The Flat-Flame is the only Practicable System for Street Lighting;
And, "in actual use," yields as much light with Common Gas, and more with Cannel Gas, than any Argand System.

BIRMINGHAM LAMP-TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candle power Lanterns are immediately required.

NOTE.—The above is the most conclusive answer to certain misleading statements which are being made by the most prominent of the defeated competitors.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

NOTE.—Mr. Sugg having freely advertised that among other places where his "burner and lantern have been adopted" is "Leeds," we have to state that, instead of having been adopted there, they have been discarded and returned to that gentleman months ago; nor is there one of his lanterns in the whole borough!

Bray's Lanterns have been adopted by the Vestry of St. George (which includes "WESTMINSTER"), Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting; and also by about 40 Towns and Vestries, after a similar competition in most cases.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

REAL OLD SILKSTONE GAS COAL.

C. A. HAWORTH & COY.,

STANHOPE SILKSTONE COLLIERIES,

SILKSTONE, NEAR BARNSLEY,

Are prepared to supply their celebrated **Real** Old Silkstone Gas Coal and Nuts. Prices quoted to any Railway Station, or f.o.b., Hull, Goole, Keadby, Grimsby, Liverpool, and Fleetwood. Every information given on application to above address, or to their Agent,

ALBERT USHER, 5 Office, Finsbury Park, London, N.

THE BLAINSCOUGH HALL COLLIERY COMPANY.

BEST WIGAN ARLEY GAS COAL.

Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from **Gas Companies and Managers**, who have used the Coal in large quantities for several years, will be forwarded on application.

Postal address, **CHORLEY**, Lancashire.

Waggon address, **COPPULL SIDING**, near **WIGAN**, London and North-Western Railway.

SAMPLE QUANTITIES SENT ON APPLICATION.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

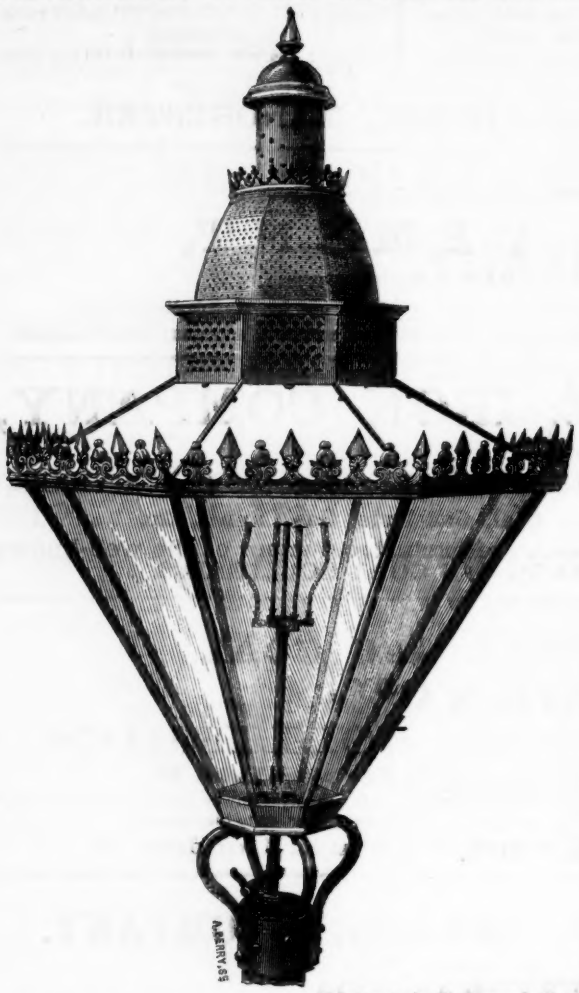
SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

WILLIAM SUGG'S
IMPROVED SYSTEM OF STREET LIGHTING,

SUITABLE FOR CANNEL OR COMMON GAS.

NEW PATTERN LANTERN for "LONDON" ARGAND BURNERS of 50 to 400 Candle Illuminating Power, as supplied to the Metropolitan Railway Stations.

NOTWITHSTANDING the various statements that have been assiduously circulated of late, tending to prejudice Public Companies, Corporations, and Vestries against the recognized superiority of my large Argand Burners (established by tests made by eminent scientists, and confirmed by testimonials received from numerous Engineers of Gas-Works, which have appeared from time to time in the Advertisements of the JOURNAL), **the Highest Results** obtained at the recent trial of large Burners for Street Illumination held at Birmingham—where the most complete collection of large Burners and Lanterns extant had been assembled—were produced by the **200-candle and other large Argand Burners of my make**; clearly substantiating the statement I have repeatedly published, that the **Sugg Burners give over 30 per cent. Illuminating Power more than can be obtained from any other Burners with the like quantity and quality of Gas.**



It remains, moreover, to be mentioned that at the same trial my **Flat-Flame Burner,** with patent circular slit (patented 1875), produced the highest result in illuminating power of all the competitive Flat-Flame Burners present.

Amongst other places, the Burners and Lanterns have been adopted at—

PETERBOROUGH	DONCASTER	GREAT GRIMSBY
LEEDS	LONDONDERRY	SWANSEA
SCARBOROUGH	SHEFFIELD	CARDIFF
EASTBOURNE	BELFAST	W. HARTLEPOOL
DURHAM	OLDHAM	SOUTHAMPTON
CHESTERFIELD	GLASGOW	PORTSMOUTH
CORK	DUBLIN	LEITH
NOTTINGHAM	HASTINGS	PAISLEY
LEICESTER	SUNDERLAND	PERTH
STOKE-UPON-TRENT	ROCHDALE	WIGAN
RAMSGATE	SOUTH SHIELDS	READING
BLACKBURN	IPSWICH	SALFORD
GREENOCK	BRIGHTON	MANCHESTER
LIVERPOOL	COLCHESTER	BIRMINGHAM
BOURNEMOUTH	NEWRY	LANCASTER

Buenos Ayres, Monte Video, Hong Kong, Singapore, New York, Philadelphia, San Francisco, Milwaukee, Quebec, Ontario, Ottawa, Boston, Sydney, Melbourne, Port Adelaide, Berlin, Vienna, Cologne, The Hague, Amsterdam, Rotterdam, Brussels, &c., &c.

Extract from the JOURNAL OF GAS LIGHTING, *&c., March* 16, 1880.

EXPERIMENTS IN IMPROVED STREET-LIGHTING AT BIRMINGHAM.

PUBLIC TRIAL, WEDNESDAY, MARCH 10, 1880.

After a prolonged inspection of the various Lanterns and Burners, tests were made by a shadow meter between Sugg's 200-candle Argand (No. 9), Bray's 200-candle Quadruple Bat's-wing (No. 10), and the Burner and Lantern as used by the Paris Gas Company in the Rue du Quatre Septembre (No. 12), with the results as shown in diagram, fig. 2. These appear to agree pretty nearly with the photometrical results obtained from each Burner, as shown in the preceding table (Mr. Hunt's Experiments, see page 404 of JOURNAL, March, 1880.)

PHOTOMETRICAL TRIALS.

No. 9. *Sugg's 200-Candle Argand Opal Top, Consumption per hour 44 cub. ft.*	*No. 10.* *Bray's 200-Candle Quadruple Bat's-wing, Consumption per hour 50 cub. ft.*	*No. 12.* *Burner and Lantern used by the Paris Gas Company in the Rue du Quatre Septembre, Consumption per hour 32 cub. ft.*
Light equal.		*Light equal.*
79·5 ft.	70·5 ft.	85 ft. / 65 ft.
150 ft.		150 ft.

FIG. 2.

NOTE.—The Lights were fixed on Posts in the manner they are used in the Public Streets.

THE RESULTS WORK OUT AS FOLLOWS:—

No. 9.	**No. 10.**	**No. 12.**
27 per cent. better than No. 10. = 191·7 Candles. Add 24·0 Candles for the extra 6 feet of gas required to equal the consumption of No. 10.	**= 151 Candles, or 8 per cent. better than No. 12.**	**= 92·8 Candles. If the consumption had been 50 ft., the Illuminating Power would have been at the same rate—138 Candles.**

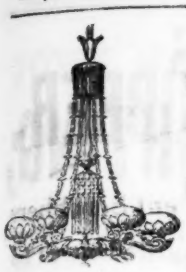
Total 215·7 Candles, or 42 per cent. better than No. 10 for the same quantity of gas.

The next best on the List is Sugg's 100-candle Argand Burner, as fixed on the Refuges in the districts of the Phœnix Gas Company, London Gas Company, Commercial Gas, and Gaslight and Coke Company. They have been, moreover, definitely adopted by the Vestries of Lambeth, St. George's, St. Mary's (Rotherhithe), Lewisham Board of Works, St. Giles's Board of Works, as well as the Great Eastern, Great Northern, London, Brighton, and South Coast, and Metropolitan Railways.

The fact that over 1200 of these large Burners and Lanterns have been supplied to almost every Gas Company or Municipal Authority in England alone, within a very short time, speaks significantly of the excellence of this system, and the real merits it has been proved to possess.

PRICES AND PARTICULARS ON APPLICATION TO

WILLIAM SUGG, GAS ENGINEER, VINCENT STREET, WESTMINSTER, S.W.



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45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

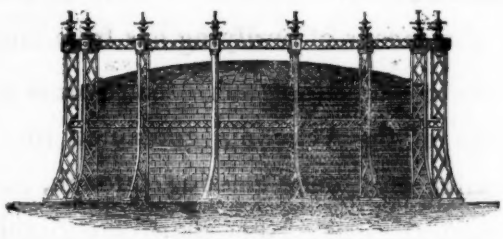
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

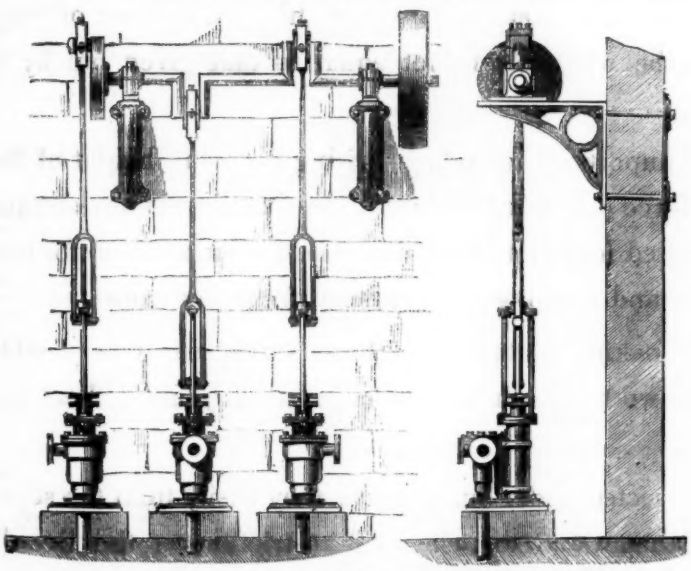
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

MEMORANDUM FOR GAS COMPANIES.

TORBAY AND DART PAINT COMPANY, LIMITED,

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S TORBAY PAINTS.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

TRADE MARK

These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.	4. Brixham Black	32s.
1. Torbay Brown	30s.		

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19. Light Stone	36s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	35s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours; and when the darker colours are selected, a priming coat of No. 13 is recommended.

Specimen Cards forwarded and Inquiries attended to on application to

23, GREAT GEORGE STREET, WESTMINSTER, LONDON.

THE MANN & WALKERS' PATENT SCRUBBER.

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

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London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

ANTI-CORRODO TUBES
(BARFF'S RUSTLESS PROCESS)

See Professor FOSTER'S *Article on "The Corrosion of Iron" in* JOURNAL *of March* 30, 1880.

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Makers of ANTI-CORRODO (BARFF'S) TUBES AND FITTINGS

For Gas, Steam, and Water; also Black Galvanized and Enamelled.

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FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

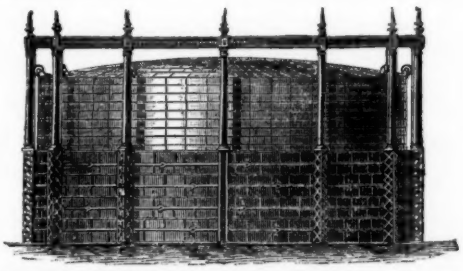
RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.



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ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,

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Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.

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BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES,

GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS, ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.

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FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.

H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.

SHIPPING ORDERS receive special attention.

H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.

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HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

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SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

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SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

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Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

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PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

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BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

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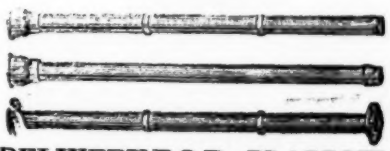
CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

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CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

MR. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

WARNER'S RETORT-HOUSE MACHINERY.

[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

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HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

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GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmeradale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

THE

SILICA FIRE-BRICK CO.,

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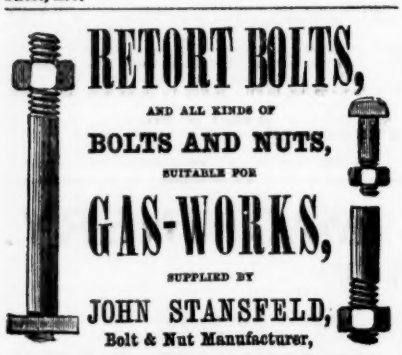

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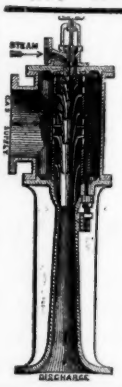

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STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

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Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.

THE LOCHORE & CAPLEDRAE CANNEL COAL COMPANY,

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Beg to intimate that the development of their Mines is progressing favourably, and that they are now in a position to supply their famous Cannels.

Quotations and full Analyses will be supplied on application addressed to the Company,

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	Cubic Feet per Ton.		Illuminating Power.		Equivalent of a Ton in Sperm.
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Brown Capledrae.	12,210	....	38·46	....	1610

THE PORTER-CLARK PROCESS

FOR THE

SOFTENING AND FILTRATION OF WATER IN LARGE QUANTITIES, WITHIN SMALL SPACE, AT SMALL COST.

(*See* JOURNAL *of Jan.* 6, 1880.)

In an article upon the Swindon Water Supply, the *Wilts and Gloucestershire Standard* of Aug. 9, 1879, says:—

"All praise is due to the Company who have thus provided a water supply that, if it can be equalled, we are safe in saying cannot be surpassed. . . . For the information of all caterers for public health, we explain that the mode of so effectually Purifying and softening the really good and naturally wholesome water is the 'PORTER-CLARK PROCESS.' 'CLARK'S PROCESS' was known to be chemically admirable; the improvements, however, effected by Mr. Porter, mechanically, are curious as they are perfect."

The filtration is exquisite, and everything arrested is removed daily.

The Visiting Justices of the Kent County Asylum at Chartham on Aug. 29, 1879—

Resolved, "That a favourable testimonial be given to Mr. Porter for his system down to the present time, and that the Clerk forward a copy of this resolution to Mr. Porter." (50,000 gallons daily.)

The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended." (60,000 gallons daily.)

(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

"The 'PORTER-CLARK WATER-SOFTENING PROCESS,' erected by you at my paper-mill at Sittingbourne, continues to give satisfaction, and I no longer have any trouble with my steam-boilers. I am not yet working the filters up to their full capacity, only softening about 80,000 gallons per 24 hours, whereas I could easily do more than 120,000 gallons. I may add that it only requires one man to attend to the whole operation."

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COMPENSATING GAS-METER.

HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

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CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Jan., 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.—We have a large and varied stock, or could make to special design at short notice.

Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c., we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.—We should be glad of an opportunity of quoting you for these when you are in the market.

Lime, Cement, Plaster of Paris.—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

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Awaiting your esteemed favours,

We remain, Dear Sirs, your obedient servants,

HARRIS & PEARSON.

Note.—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.

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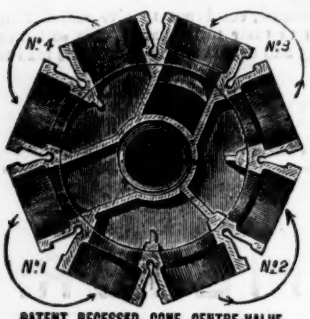
RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



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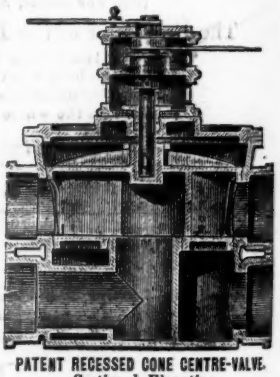
Sectional Plan.



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By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

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For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

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